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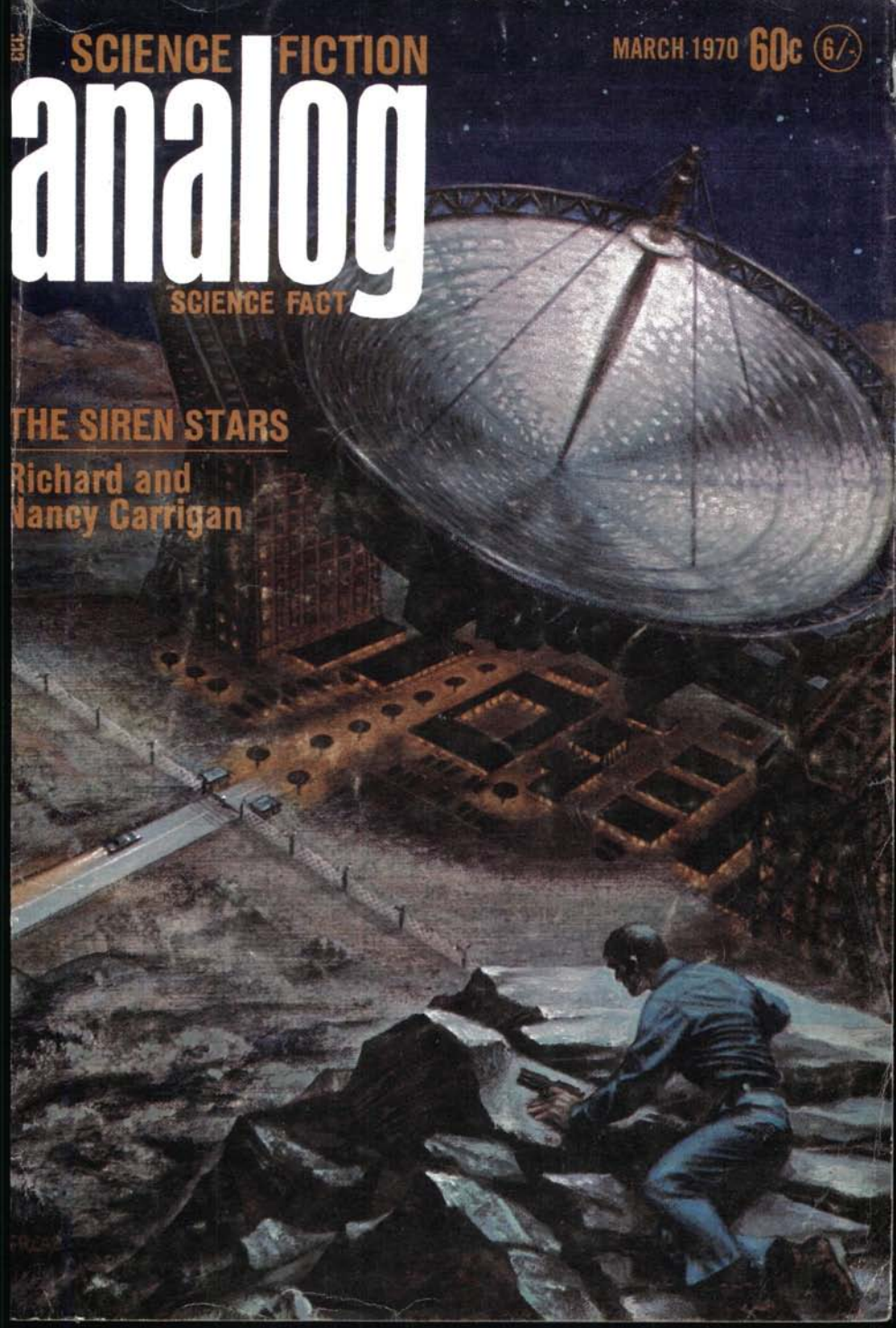
THE SIREN STARS

Richard and
Nancy Carrigan



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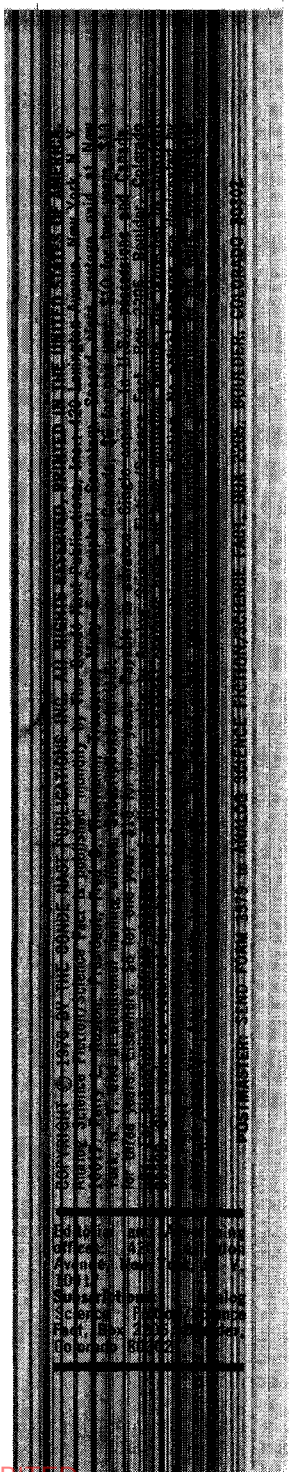

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GOOD-BYE BARSOOM

Editorial by John W. Campbell

The most widely read science-fiction stories of all were those wonderful tales of John Carter of Mars by Edgar Rice Burroughs—which might more properly have been labeled "by Edgar Rice Burroughs and Percival Lowell," for Burroughs laid his wild adventures of swords-and-semi-science on a Mars designed according to the beliefs of Percival Lowell. Lowell established the Flagstaff Observatory quite largely because of his deep interest in planetary studies—to study Mars, and his vision of the planet as a world such as that that Burroughs brought to life in his stories of "Barsoom." A world of dead sea bottoms, of ancient canals bringing water from the polar snows to the plains of Mars, drying out gradually as the water seeped slowly away into space.

One might say that Flagstaff Observatory was the first science-fiction observatory—and Lowell, a deeply frustrated scientist, never managed to get a satisfying glimpse of the planet he was so keenly interested in.

Today, Flagstaff Observatory rather hotly rejects its origins; the dreams old Dr. Lowell had they find embarrassing. Apparently they want to forget all about the dreams of the dreamer who worked to establish the observatory! And they'd much prefer that Burroughs never wrote his enchanting tales of Barsoom—of the dead cities—the six-limbed green Martian, giant Tars Tarkas, and the ever beautiful Deja Thoris.

The yarns were too good to forget—but we'll have to move their locale to Alpha Centauri A-IV . . . for a while, at least! Wait another generation, and maybe they'll have to move farther, as *that* planet becomes known!

The reports on Mars that the Mariners IV, VI and VII sent in make the Lowell-Burroughs Barsoom 100% *out*! There are no "dead sea bottoms." There are stupendous impact craters 250 miles across, however. The "snows" of the polar caps don't melt; apparently they're Dry Ice—solid carbon dioxide, with a temperature of about 190° below zero F. Not only are there no vast irrigation canals—even Schiaparelli's original *canali* don't exist. *Canali,* in Italian, doesn't specify *canals*—it means "channels," which could have been riverbeds, game trails, railroads or superhighways. But even the far more conservative term *canali* has proven wrong; they are artifacts of the observer's eyes and mind, products of the human visual system's tendency to find relationship

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among scattered details at the edge of perception. (Such a tendency pays great dividends in an evolving species; it helps in spotting camouflaged enemies or prey. But it handicaps planetary observers!)

Barsoom is gone—and with it, a lot of the science fiction that's been laid on Mars.

But that's all right for us—there's a world out there that we know a lot more about, now, and we can work out the problems of living on *that* world.

And the data indicates that it *could* be lived on.

First, the landscape is NOT what we—and Lowell-Burroughs—visualized. It's far more like the Moon than like Earth. An immensely bleak, nearly airless, crater-pocked landscape. One Mariner photograph shows a 125-mile diameter crater with a 15-mile diameter crater blasted into the rim of the greater one, and an Arizona Meteor Crater size crater in the middle of *that* crater.

It's *dry*. The infrared and ultraviolet spectroscopes on Mariners IV, VI and VII agreed on that; the VI and VII reports definitely found evidence of oxygen and hydrogen in the atmosphere, so there's some water vapor—but exceedingly little. There appears to be very little nitrogen present; early reports that there was no nitrogen, but that ammonia and methane were present seemed a little odd. Ammonia being NH_3, it seemed unlikely that that would be present—and no nitrogen! Solar UV would have broken down some of the NH_3, certainly.

Later studies clarified the problem—it wasn't ammonia; the lines in the spectra interpreted as ammonia proved to be due to reflections from various carbon-dioxide-ice-carbon-monoxide effects.

Moreover, since the rocks brought back from the Moon have been analyzed, it now appears that the Lunar surface, at least in the Tranquillity area, is essentially unchanged since it formed some 3,500,000,000 years ago. That was a considerable surprise; that implies that the immense bombardment of gigantic meteors that produced the pockmarked face of the Moon happened while the planets were relatively young. The Solar System itself is believed to be only about five gigayears old, and the Earth's age somewhere around four and a half gigayears.

Mars' surface is so much like that of the Moon that non-experts could readily be convinced that Mariner VII shots were pictures of the Moon's surface.

That makes it probable that Mars' surface features have been little affected since the Great Bombardment of 3.5 gigayears ago.

Earth must have been clobbered about as thoroughly as Mars and the Moon—in fact somewhat harder, for Earth's greater gravitational

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power would make impact energies even greater. But Earth had, and has, the enormously powerful weathering forces of wind, water, and freezing-thawing to melt away mountains, and transport their fine-ground remains thousands of miles as silt. Plus the immense tectonic forces that push the crustal plaques around, rearrange continents, and create immense mountain ranges. When the subcontinent India broke away from Africa, shifted northeast, and collided with the Eurasian land mass, the surface crumpled into the vast mountain system of the Himalayas.

Things of that nature can wipe out all trace of the Great Bombardment. Neither the Moon, nor Mars, can have any such powerful forces at work.

So there are no struggling Martians desperate for water; if there are any Martians—they like it dry. They must have evolved on a desiccated planet. Mars' lose of air and water hasn't been gradual; it was essentially complete two or three billion years ago. What there is now must be in equilibrium with the slow, slow outgassing of the planet's rocks, the Solar Wind, and the slow escape of gases from the light gravitational field of the planet. Any life forms on the planet must have evolved over many ages—and throughout those ages the planet's been desiccated and near airless. And remember that any life form considers the conditions for which it evolved "ideal conditions." A Martian life form would consider temperatures ranging, during the day, from +75° to −100°F, with sunlight about half as strong as Earth's, almost total dehydration, and raw solar ultraviolet as "ideal" growing conditions.

We're not talking about terrestrial plants gasping for life on Mars—we're discussing a form that might have evolved there during the last 3,000,000,000 or 4,000,000,000 years. A life form doesn't "struggle for life" for three or four gigayears; it learns to love those conditions . . . or it's dead.

The discussions I've seen on possible life forms on Mars have, in my personal opinion, been foolishly conservative—they've lacked imagination.

First, let's consider that daily temperature range—as observed by the Mariner VI and VII infrared equipment. Daylight temperatures as high as +75°F were found; nighttime temperatures on the order of −100°, with the −190°F temperature of the antarctic night.

Item: On the Pamir Plateau in Siberia, winter temperature readings as low as −90°F can be expected; a temperature of −110°F was reported in one spot. (That's the temperature at which CO_2 will start crystallizing out of the air!) The Pamir Plateau has a fine cover

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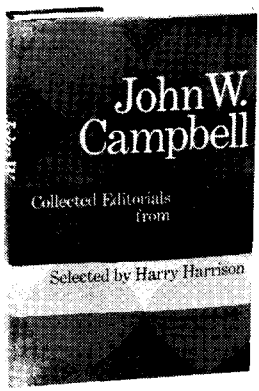

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of vegetation. Conclusion: Even terrestrial plants adapted to a warm, wet world can stand such conditions in a dormant state.

But we're not talking about terrestrial-type plants. Let's design plants that are meant for a desiccated region with 180° daily temperature swings.

Obviously, if the plants are to stay active, they need an effective antifreeze in their metabolism. Water is present on Mars—it's in short supply, but it's there. Since water is far and away the most active solvent possible, we'll assume the plants of Mars use water as a metabolite solvent. How they get it we can figure out later.

To keep it from freezing at −100° or so, we need antifreeze. Fine! And that's easy; practically all the anti-freeze solutions used on Earth are simple organics that plants either normally do, or could, produce. Glycerin is almost universal in plant and animal metabolism. Ethylene glycol, ethyl and methyl alcohol are widely used antifreeze additives; ethyl alcohol is normally produced by plants called yeasts; methanol, "wood alcohol," is also readily produced by living cells. Ethylene glycol doesn't seem to be very popular with terrestrial plants—but there's no reason Martian plants couldn't use it conveniently. *continued on page 177*

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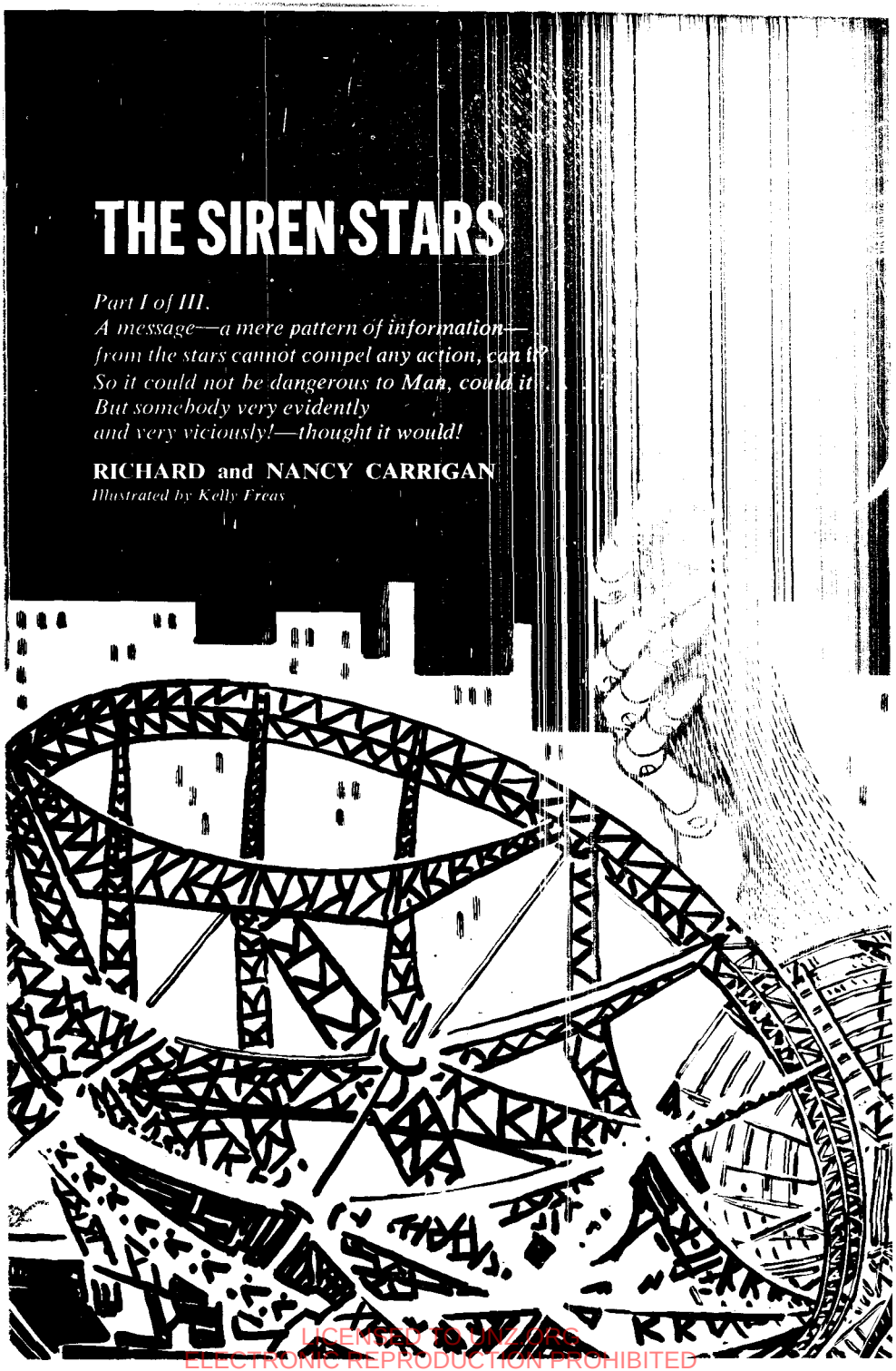
THE SIREN STARS

Part I of III.

A message—a mere pattern of information—
from the stars cannot compel any action, can it?
So it could not be dangerous to Man, could it?
But somebody very evidently
and very viciously!—thought it would!

RICHARD and NANCY CARRIGAN
Illustrated by Kelly Freas



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If I knew of something that was useful to myself but injurious to my family, I would cast it from my mind. If I knew of something which was useful to my family but not to my country, I would try to forget it. If I knew of something that was useful to my country but injurious to . . . the human race, I should regard it as a crime.

Montesquieu 1689-1755

I

The fat, pinkish-white shape lay stretched out on the warm concrete baking in the New Mexican sun. When it felt the vibrations of the powerful motor, it raised its head and gave the car a bored, unblinking glance. The red Triumph skidded to a startled halt a few feet away as the snake wriggled lazily off and became one with the waves of heat rising from the desert.

"Well, I'll be damned," the driver muttered aloud, "an albino rattler!" Glad of the opportunity for a break in his long trip, he pulled the car to the shoulder and got out to stretch his tired arms and cramped legs. He reached for a small thermos of iced tea and drank thirstily.

Had she been there, a scientist's wife probably would have guessed the man's profession without knowing what had given her the clue. Perhaps it was the casual, almost absentminded way he wore his clothes, or the slight hunch of his broad shoulders. His eyes, intent and rather introspective, would have been a good clue had they not been hidden behind his tinted driving glasses.

He turned now to look at the mountains rising sixty miles or so away, stretched once more and returned to his car. "Nothing for miles but miles," he agreed with the old New Mexican saw as he sourly returned the mild gaze of two head of lanky range cattle. The car's engine again broke the stillness as he accelerated quickly to eighty and headed for the cool green of the mountains ahead.

The last town had consisted of two buildings: a single dwelling, and a combination gas station, general store, restaurant, and post office, which suffered from its lack of specialization by not being very good at anything. He did not intend to stop again until he was at Sunseek.

He was eager to see the giant radio telescope at this installation. Newspaper features of a few years back had carried the story of the scientific objectives of the New Mexican laboratory. It had been constructed, they said, "because of the mounting importance of radio astronomy as a research tool."

"A little out of my line," the driver mused to himself as the little car climbed into the pine forest that covered the mountains he'd reached at last. "I wonder what

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Silverman's called us out here for."

As it passed 8,000 feet he could feel the Triumph gasp a moment for air and then he rounded a turn and saw the green and white sign pointing to a black-topped road to the left, "National Radio Observatory, Sunseek, New Mexico."

A mile or so down the approach road stood a gate house set in a barbed-wire-topped link fence. A uniformed guard motioned the car to a halt, leaned to the window, and spoke politely. "May I help you?"

"Yes. I'm with Dr. Silverman's group."

The driver handed the guard a small plastic card printed in the rather sterile style of the G.P.O. The card bore a red stripe around its edge. The guard took it to the gate house where he entered the number and name on his visitors' list. Then he inserted it into a machine, which could read the identifying combination of flourescent dyes printed into the stripe. The machine confirmed that the owner was a government agent authorized to visit the site. It did not read the second number, a small series of bar magnets impregnated into the plastic. Only a few knew that the number existed, and the rest did not need to know.

The guard returned to the car, pasted a sticker on the windshield, and returned the card to its owner. "There you are, Dr. Leigh. You'll find Dr. Silverman's office in the Administration Building. That's the yellow stucco one with the flagpole in front." He raised the heavy steel gate and waved the red car on.

Following the road toward the Administration area, he found several buildings with filled parking lots. His practiced eye scanned the size of the buildings and the lots, guessed that most of the personnel were technical from the types of cars in the lots, and came up with a rough estimate of the minimum annual budget required to run the installation. "With the support personnel, about ten million dollars." His eyebrows raised a bit in surprise. "Quite a chunk just to look for quasars, especially if this isn't the whole works."

He pulled the Triumph between a dark-green Jaguar XK-E and a Chevy sports coupe of venerable age, and gazed toward the giant antenna of the radio telescope higher up the mountain. As he walked nearer to it, Leigh was more and more awed by the size of the giant dish. He had imagined this part of the telescope facility by the old high-school measure "two football fields end-to-end." But seen close up "two football fields end-to-end" in the shape of a dish fixed so that it could be rotated was impressive to say the least. The telescope was suspended between two gantry-like towers which extended three hundred fifty feet into the air.

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By sighting on a distant mountain and the dish he could see that the dish was moving relentlessly forward. "It must be following a radio star right now. Wonder how often they use it to track missiles and satellites."

Almost in response to his thought, the telescope moved with surprising rapidity from its slow tracking to a new point in the sky and there began to track much more quickly. As it moved he could see the sun flashing against the individual panels in the dish as they changed slightly to accommodate the changing stress pattern. Leigh remembered that this was the trick that had allowed such an enormous dish to be built.

The cost for a rigidly-fixed dish would have been prohibitive. Instead the designers had fixed each small segment of the dish on its own servo. Each area looked back at a post in the center and from this sent an error signal to a digital computer. The computer solved the equation for a parabolic dish and adjusted the sector accordingly. This went on a number of times a second so that the sectors appeared to flicker almost continuously.

"That's a real toy to play with," he thought a little enviously. "A real toy."

He turned and walked toward the low-slung Administration Building. Somehow the architect had achieved an attractive Mexican look within the limits of government economy. The American flag whipped in the wind. "I'll bet they have to change that flag every week," he thought absently as he pushed open the heavy glass door and the chilly air-conditioning inside hit him in the face.

The blonde at the mail desk had been hired for her ornamental qualities as well as her fast hand with the correspondence. She seemed slightly flustered when Leigh asked her for directions to Dr. Silverman's group. It was obvious that she hadn't been asked the question many times and that her curiosity had been aroused. She looked at a chart. "Is that the place they call 'Science Processing'?" Leigh nodded. "Go to the second floor and it will be in a corridor next to the Library."

John returned the bright smile she sent across the desk. Like most men, he approved highly of ornamental mail girls providing they didn't mangle the correspondence too badly.

The girl working in the room marked "Science Processing" was less ornamental and wore a scholarly air behind horn-rimmed glasses. As Leigh reached for his wallet she spoke in a rather bored tone. "We only handle special abstracting. We can't give individual help with literature searches." Her reaction took Leigh by surprise. He was getting irritated. He felt that someone ought to recognize him by now.

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"Dr. Silverman asked me to drop by."

The girl was still bored. "Your name, please?"

"Dr. John Leigh. Dr. Silverman will recognize my business when he hears my name."

The girl removed a list from her desk and inspected it with maddening thoroughness. "There is no such name on today's list of expected visitors."

"Now see here—" Then John remembered that Silverman never had appreciated the qualities of the little red Triumph, or its driver. "Would you please check tomorrow's list?" he said and showed her his card.

The bored look changed suddenly. "Oh, I beg your pardon Dr. Leigh. I'll ring the inner office. Why didn't you show me that in the first place?"

In a moment a man appeared at an inner door. It was Roger Krammer, Silverman's executive officer. "Leigh, what the devil are you doing here so soon? We expected you tomorrow at the earliest. Come on in." They went together into the room and all the familiar sights of Science Processing, Inc.

"Why, hello, John. You certainly made good time." Emily Parkway crossed the room and raised her cheek for Leigh's customary kiss. A handsome woman of about thirty-five, she had been Silverman's private secretary for as long as Leigh could remember.

Behind her an alert-looking young man rose wordlessly and slipped his hand toward the waistband of his trousers under his coat. John knew that he carried a gun there. He did not recognize the serious young face, but he knew that this was one of Silverman's "personal assistants," a euphemism for "bodyguard," and it was an indication of Silverman's importance that such a man kept him in sight twenty-four hours a day. While they served partly as protection, these "personal assistants" also helped to maintain a steady communications link so that messages could reach their boss at any time.

The room looked much like Silverman's main office at headquarters. It was about the size of a large college classroom. There were three desks, one for each person, and a number of filing cabinets. The most remarkable furnishing stood in one corner. A businessman might have taken it for a very elegant dictating machine. A scientist would have immediately thought it a digital computer with three electronic bays on it and a number of magnetic tape units. Both would have been partly right. As a matter of fact CARA—Communications and Reduction Apparatus—was the mechanical heartthrob of Science Processing. Her small tape units spun back and forth even now as signals from channels all over the world filtered

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into the machine, were tape-recorded, and then decoded in her mechanical brain.

Leigh moved over to inspect CARA's pale green cabinet. He turned seriously to Emily. "An interesting machine. Don't believe I've ever seen one like it."

Mrs. Parkway's eyes twinkled, but she answered solemnly. "Yes, it is unique with our service. We have technical abstracts from journals all over the world mounted on the tapes. These have a number of code words attached. For instance, if a chemist wants to know about a type of white paint that won't be attacked by neutron bombardment, he will give the computer the code words PAINT, NEUTRON, and CHEMISTRY. The computer will type out the index numbers of the abstracts that contain these words. Right now the system hasn't been perfected so we cannot allow outside scientists to use it. However, we will be glad to give you some literature describing our process and the company."

Coming from Emily Parkway, these words of the cover story with their element of truth, sounded perfectly plausible. And as a matter of fact, Emily had been chosen for her position partly for that reason. Smoothly tailored, charming, and intelligent, the young widow looked the part of the efficient secretary to perfection. Silverman had filched her from the head of the Physics Department when he left the University to set up Science Processing. The head had hated to see her go for she was that rarity among women—the completely discreet human being.

"The Professor's on the phone now, but I'm sure he'll want to talk to you as soon as he is free." Emily dropped their little joke and became all business again.

Leigh turned to Krammer and asked. "Just what is the point of all this sound and fury. I haven't heard Silverman so excited since that CIA bigwig tried to swipe Emily away from him."

Krammer folded his arms across his chest and settled himself against Emily's desk in a "young executive" pose that never failed to set John's teeth on edge. Somewhere in his career Krammer had acquired the reputation for being able to manage scientists. *And the gods preserve us from those who think they can 'manage scientists',* was Leigh's predictably grumpy opinion. He privately considered Krammer one of Silverman's rare rash acquisitions.

"Of course I'll have to let the chief update you fully on this latest fling. Frankly, compared to some of the other picnics we've been on this seems rather tame," Krammer began.

"However, as you know, the government pays the company to ride herd on all the technical things the Red boys cook up. Well, sev-

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eral months ago the radio astronomy desk noticed that the rate of publications of a well-known Russian radio astronomer by the name of Gregori Petrov had dropped to nothing. Ordinarily we might have found an increase in some related field, such as aircraft detection with very high-power radar. However, further research revealed that Petrov was still at astronomy.

"Then someone noticed that the change in his publication pattern had happened at about the time an enormous increase in the signal-to-noise detection capability of the masers used in radio astronomy had occurred. A visitor to Russia, some months before, had heard Petrov say quite openly that this would make the detection of intelligent radio signals from many hundreds of light-years in space possible. Now this fellow seems to feel that he has detected something civilized out there."

For the second time that day Leigh was more surprised by the facts than he had expected to be. "People had hinted at communication from outer space back at headquarters, but I thought they were just talking about some technological advance."

Krammer replied, "Even allowing for the implications of a message from outer space, old boy"—Leigh winced at the phrase—"what possible bearing can it have on the so-called cold war? I can't see why the chief would go to the trouble of moving headquarters all the way out to this God-forsaken Sunseek just for that."

"Good to see you, John." A rich voice straight from the Harvard Yard suddenly filled the room. Silverman's familiar figure appeared at the inner doorway and motioned Leigh to follow him into a cluttered private office.

II

"If you keep driving like this," Silverman looked severe and amused at the same time, "that car of yours is going to sprout wings and take off. Maybe we'd better take out flight insurance on you."

"But, Professor, you said this was a rush job, and you know how devoted I am to following orders. When you say 'rush', I rush."

"Devoted to following orders!" His boss laughed. "What about that time at NATO. I still shudder when I think how you 'followed orders' then." The head of SPI shook his head ruefully at the memory. Still, the information on the French atomic setup had been useful even if Leigh had been sent to catch that physicist spying for Russia. There was just no denying Leigh's combination of intuition, technical skill, and dumb luck. *He'll need them all on this one,* Silverman thought as he pulled his swivel chair up to the desk, and motioned Leigh to a nearby chair.

"Have a seat, John. I'll be with

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you in a minute." He pulled his phone over and dialed two numbers. "Dr. Leigh's here. Can you spare us half an hour? . . . Fine. We'll be looking for you."

Leigh observed his boss as he talked and mused again how little he seemed to change in the ten years they'd worked together. The grizzled head seemed no grayer. The usual rumpled tweed sports coat hung the same comfortable way on the slight, small frame. The same Holmesian pipe lay in a giant stoneware ashtray on a desk organized in the same crowded fashion. But Leigh noticed a deeper set of the pale blue eyes which made their gaze seem more intent than ever.

Silverman hung up the phone and turned again to Leigh. "I heard the tail end of Roger's explanation. The story on this job is that the Russians have heard signals from outer space they take to be intelligent. I know you're familiar with some of the background of the subject, but it's all pretty complicated. Rather than leave any loose ends by explaining it myself, I've called in an expert. He'll be here in a minute."

At that Silverman sat back and began a ritual no member of his staff dared to interrupt. He patted all his pockets, searching out matches, tobacco, pipe cleaners, and tamper and began carefully to fill the large, blackened briar. Leigh brought out his beloved meerschaum and by the time the mellow aroma of tobacco smoke filled the little office there was a discreet knock on the door.

Emily Parkway entered, followed by a tall, straw-haired Dutchman who barely cleared the lintel. Leigh watched amused as the big man stooped slightly going through and wondered how many times the high, shiny forehead had been cracked on a low doorway.

The pipe smokers rose and John shook the big, shyly-offered hand. "Dr. John Leigh, this is Jan Van der Pool. Dr. Van der Pool is on the staff here at Sunseek. He's made a special study of communication with extraterrestrial intelligent systems. How about filling John in, Jan?"

Van der Pool folded the little of him that would fit into the remaining chair and cleared his throat.

"This problem of intelligent communication from outer space is not new," he began. "People have speculated about life on Mars, the Moon, and so forth for a long time. However, with the coming of modern technology, some of the speculations have become quite explicit. In fact, the whole subject has got rather complicated, with its own body of experts and literature.

"Nowadays some people spend nearly all their time on it. Until several months ago I was only casually interested in the matter . . . my field was the mapping of hy-

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drogen through the galaxy with radio astronomy . . . however, this thing with the Russians got me curious so I knuckled down to it myself pretty much full time." He rose and began to pace the room as if addressing a class.

"Four scientific developments have led to the present view that radio signals from intelligent sources in outer space might be detected. Nearly everyone thinks that life would probably originate on planets rather than elsewhere. It's true that the English astronomer, Fred Hoyle, once wrote a science-fiction story, 'The Black Cloud,' in which intelligence arose in a different way, but such possibilities are not as widely considered as the planetary theory

"It is also felt .hat life would develop more or less in the same way as it did on Earth—not, of course, the same forms, but with the presence of water, proteins, and so on."

Here Leigh frowned. "That seems to lack imagination to me," he interjected. "It's too anthropomorphic. There are so many other possibilities we may know nothing about."

"That may be," Van der Pool agreed, "and the idea raises even more unanswered questions. But that's another story and I'm just skimming the surface of the current favorite theories.

"As you know, years ago people felt that planetary formation came about because of the near collision of two stars. Such an event would have occurred very infrequently so that the number of planets would be very small. Now, however, the experts think that planets arise in the original condensation of the star so that they are quite the usual things. Indeed careful observations of some star motions have shown this probably is true.

"Similarly, people thought that the starting of life was something of an accident. Now experiments indicate that proto-life organic molecules form almost as a matter of course in an ordinary planetary atmosphere. If these two ideas are correct, it seems that life is quite frequent throughout the universe.

"With the advent of high-power radar technology after the Second World War, it was clear that the power was available to send a directed pulse to a distant star. In the Fifties, the discovery of masers made possible the building of receivers with a good enough signal-to-noise ratio to detect very distant signals.

"The trouble, of course, is that there are a hell of a lot of stars out there and a hell of a lot of frequencies to listen on. It's not only like searching for a needle in a haystack. We're not even sure where the damned hayfield is." He paused a moment and his forehead creased in frustration as he contemplated the enormity of the problem. Then he shrugged slightly and began pacing again.

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"Then," he continued, "someone suggested that the most frequently-occurring wavelength in the universe was the 21 cm emission from hydrogen. Since that frequency lies in a place where signals are not attenuated by planetary atmospheres, it seems natural to first consider, say, half or twice the frequency of the hydrogen emission."

There was another pause as Van der Pool began the familiar ritual of rummaging through his pockets. John broke in again. "You're giving our friends out there credit for a lot of sense. You figure they'll realize there'll be too much radiation from the hydrogen floating around in nature for them to be heard on 21 cm and they'll choose multiples of the frequency." He shook his head. "It'd be the devil's own luck if they turned out to reason enough like you for all of you to get on the same wavelength."

"Well, we have to figure, first, that they're intelligent or they couldn't get together the equipment to send the signal." Van der Pool countered. "Second, they would choose a frequency with a relatively uncomplicated formula for its dislocation because they want, after all, to be heard. Besides," he added somewhat defensively, "can you think up anything better? We had to start somewhere."

At last Van der Pool's big, homely face lit up as he fished from an inner coat pocket the package of spearmint gum he'd been hunting for. He offered it round.

"I finally gave up my pipe," he explained. "Never could keep track of all the paraphernalia." Van der Pool grinned sheepishly at the other two puffing contentedly at their pipes. "Besides, I never did learn to keep the damned thing lit."

The men all laughed, then John spoke again. "What about spaceships and things like that? Wouldn't that really be the way for some super-civilization to find out about another star?"

This time Silverman replied. "Several years ago I heard a lecture by Professor Purcell at Brookhaven in which he examined the various possibilities. It turns out that it is possible to send a spaceship to a very near star, perhaps a light-year away. The expenditure of energy would be immense and, of course, if that star didn't have useful planets the expenditure would be wasted. Bringing the spaceship back would be an almost impossible feat. The initial ship would have to be about a billion times bigger than the returning one to make it work."

Van der Pool demurred. "With conventional systems that's true. But in the past I've wondered if maybe Professor Dyson's speculation couldn't be right. He wondered if a really advanced civilization might be able to usefully employ the energy of the star itself."

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Finally Leigh voiced his skepticism. "That's what is wrong with this whole chain of reasoning. When you tell me any single thing it seems plausible. Then when you add the whole works together it seems crazy. You see what I mean? The parts are O.K., but the possibility of them making up the whole picture is too remote. Maybe we don't know some technical gimmick any self-respecting two-year-old in this hypothetical super-civilization knows. We've only just found out about laser beams. What about sending the signals on light?"

"That's one of many untried possibilities," Van der Pool agreed. "That's what always bothers me. I realize we've only scratched the surface of technical knowledge. So far as the rest of the universe goes, we may be as primitive as cavemen. However," he dropped his bombshell, "the facts are that the Russians have received a signal so the thing we would have both referred to as too remote has already happened."

Silverman nodded to Leigh. "Yes, they're regularly receiving the signal on twice the hydrogen frequency. We aren't sure what star they're receiving it from, but the fact that they are is based on unimpeachable evidence."

Both pipes had gone out unnoticed. The three men were silent. Finally Silverman spoke. "It seems to me that their reception of the signals could raise several grave problems. One possibility is that the signals might contain some useful information that the Russians could exploit. For example, it's possible that the signal might tell them about a practical way of harnessing thermonuclear reactions. Certainly anything like that could be imagined. Once they had this, they would have an unbeatable edge and could more or less dominate the world. A second, only less disconcerting, prospect is that the signals would not contain such information but that the Russians would say they did and use the threat to blackmail the U.S. They might picture the other civilization as being communistic and claim that the signals told them a parable in which a capitalistic society had failed. The burden of proof would be on us. How could we erase all doubt that they were lying?

"Finally, I can imagine that the publicity value they will gain from announcing that they have received any signal at all will be enormous. Remember when they sent up the first satellite? It took the world a year or so to calm down after that story broke. It even affected our own educational system."

"What do you propose to do about it?" John knew that somehow the answer was going to affect his immediate future.

Silverman unlocked a drawer in his desk and drew out a folder. "The organization is working on

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several tacks. Jan, here, is advising me on the astronomical side of things. In fact the government is devoting nearly all of the time on the large radio telescope to trying to find the star.

"I felt that I should be near at hand to watch those developments so I moved the office out here temporarily.

"Our other sources may, or may not, find out which star it is by checking on the Russians in various ways. However, it seems to me that the most direct thing to do is to try to see which way the Russian telescope is pointed when it is observing the star." He turned to John. "And so I propose that you go out there and look."

Van der Pool let out a gasp. It was obvious that he wasn't yet used to the idea of scientific spying.

"Do you mean that Leigh, here, is to go into Russia on the sly and photograph their radio telescope?" Silverman ignored the shocked tone of his voice. "Yes. It seems to me that he should do the following: First and simplest will be to observe the telescope's direction at any given time of day. If he is familiar with the terrain, he can probably estimate the antenna's position to within 1° if he's careful. Then, if he can take some photographs of it, we can tell much better from the pictures. Of course we know the exact time the pictures are taken, and some directions will be better than others. This is one of the reasons I need a scientist to do the job.

"By the way, John, we will expect you to radio back all your information up to this point in the plan."

Leigh nodded.

"How will the pictures get back?" Van der Pool asked.

"His transmitter will carry a facsimile system somewhat like the ones used in satellite photography of the Moon and Mars. The transmitter is specially designed and is most effective, as Dr. Leigh has already discovered in some previous, er, 'experiments'.

"Now one of these techniques may work, but the best thing of all would be to obtain information directly from the files of the installation. The radio telescope they use seems to be quite similar to ours. As you know, our telescope is hooked up to a very large digital computer—that is, it operates on line." He turned to John. "This computer performs a number of functions. It solves the equations that align the individual elements of the dish so that they are shaped like a parabola. It also points the telescope by referring to two smaller radio telescopes that look at different point radio sources and determine an absolute direction in space. Then as the signal comes in, the digital computer unscrambles it from the static, mostly using Fourrier analysis. In our system

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one of the magnetic tape units has a master record on it that contains the position of the telescope at various times with little notes about what it was looking at. If you can secure the similar Russian tape, it would be invaluable."

"Why that would mean penetrating to the very heart of the installation." Van der Pool rose and shook his head. He resumed his habitual floor pacing. "Even if he could get inside, how would he recognize the proper tape?"

A slight smile came to Silverman's face. "Sit down and relax, Jan." He waited until the Dutchman was seated and held his worried gaze with his own intent, steel-blue one. "Now I know you're a very good radio astronomer. As such I expect that I can ask you to do some reasonably difficult task of radio astronomy and you'll have some chance of succeeding. In his field Dr. Leigh is an expert also. He reads and speaks Russian fluently. He knows something about computers and I am confident that he can learn more. I expect you to teach him what he needs to know about radio astronomy. He has already had some experience operating in unfriendly areas where his presence was unwelcome to say the least. All in all I'm sure he has a good chance of making a go at this.

"It does seem to me, however, that we should have a practice run-through, so here's what we'll do. You teach him all the details he needs about radio astronomy and the associated computer operation. But don't show him the installation. Then after several weeks we will have a dress rehearsal by letting Leigh try to penetrate our own installation."

"Ah, I see. A sort of laboratory dry run." Van der Pool's face was relieved for a moment, then he looked more worried than before. "But it seems still like an almost impossible task. Our own guards and security people are very careful. And surely the Russian ones will be even more so with the stakes so high."

Silverman leaned forward slightly. His voice was grave. "That's true, Jan. But this information could be very valuable. We must try to obtain it in any way possible. You will start training Leigh tomorrow. We don't know how much time we've got, but we do know it's not much."

III

Silverman watched Leigh and Van der Pool leave the office. The Dutchman's face was a picture of concern. As his tall figure ducked through the doorway, Jan absentmindedly ran his hand through his wiry yellow thatch, still amazed at the plan in which he found himself involved.

The head of SPI sighed deeply as the door clicked shut and reached

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for his pipe. Leigh had listened with his usual intent expression to the new assignment. It was hard to tell what he was thinking as he was handed this new and surely dangerous job. That John Leigh would be hard to unnerve, Silverman knew very well. The man had seen too much to be surprised.

Van der Pool, on the other hand, had been openly shocked. Silverman felt far more sympathy for the astronomer than he had shown. He could remember too clearly his own reaction to the meeting with the President that had marked the birth of Science Processing, Inc.

Professor Silverman was not a newcomer to Washington nor to Pennsylvania Avenue when the meeting took place. He had been a regular visitor to the Capitol in connection with securing funds for a nuclear reactor which his university had hoped to build with three other schools. Although Silverman had been a relatively junior member of the distinguished committee of scientists from the hopeful four, his surprising skill in handling officialdom had gradually placed him in the position of contact man with Washington.

After several months of effective work on his part, the government had been on the point of granting the funds. Silverman was much relieved. The negotiations in Washington had removed him from his research and he was yearning to return to the laboratory. He had a solid reputation as an experimentalist in the field of nuclear physics, but the subject was currently such a dynamic one that he hated to be out of touch for very long.

He returned home to a delighted wife and an even more delighted group of graduate students waiting eagerly with their innumerable, but to him exciting problems, and settled down to the work he loved.

Then the best-laid plans of the four universities went askew. A revolution threatened the Panama Canal and the Far Eastern pot got to bubbling dangerously. Defense spending had to be increased. "Guns vs. Butter" worked in classic fashion and the money for the reactor went for new jet fighters and jungle warfare troops. Rumors to that effect circulated quickly in the physics labs and offices on the four campuses, but there was nothing official for weeks.

When the call from the White House had come, Silverman was astounded. He hadn't thought that the President himself consoled disappointed funds-seekers. But the message had requested Professor Silverman to call at 1600 Pennsylvania Avenue at 10:00 a.m. three days hence.

Washington is at its loveliest in May. The pink and white azaleas looked gigantic to Silverman who thought of azaleas in terms of the little potted plants he got Rachel

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each Mother's Day. The air was balmy with only a hint of the stifling mugginess that would come with summer along the Potomac.

Silverman had been ushered directly to the President's office. The President was alone in the room. He took the scientist's hand and, while shaking it warmly, somehow propelled Silverman into a large, dark-blue leather chair.

"I was sorry we had to turn down your request last week, Professor," he began. "These tools for basic research are very important for the nation to have, and while this particular reactor isn't feasible right now, I suggest your group try to submit a more modest proposal—perhaps stretching the project out in time, or asking for a less expensive installation."

Silverman's ideas had begun to run to these same lines already. This seemed to lend an official stamp to the plan. Still baffled by the President's personal concern over what must be, to him, a minor matter, Silverman said he would carry his message back to the committee, thanked him for his interest, and rose to leave.

"Just a moment, Dr. Silverman. I have one other matter to discuss with you before you leave." Silverman seated himself again on the stiff blue leather. The President folded his hands on the desk before him and leaned forward intently.

"In a sense," he said, "our reputations are built on the same skill—that is the ability to negotiate with a number of people and find a solution that is both farsighted and satisfactory to as many of those people as is possible. As I read over the proceedings of the negotiations for the installation you were requesting, I liked the way you managed your attack.

"Now a matter has come up in the government that could use someone with your resources. In the last six months a secret evaluation of our intelligence agencies has been conducted by a committee made up of a cabinet officer, two senators, and a member of the chiefs-of-staff. This group has posed itself to the agencies involved as a friendly review board. In fact it was created to investigate some very critical comments made about them. I'll let you read the complete report later, but what I have to say is more specific.

"One of the major suggestions that the review group made had to do with technical intelligence. They found that all of the agencies had some people monitoring scientific developments in foreign countries, but that most of the monitoring was done to detect specific things. They recommended that we create an entirely new agency, or a branch of an existing agency, which would watch all of the technical literature and scientific personnel in foreign countries with the idea of detecting strategic changes."

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"That's quite an order," Silverman replied. "Most of us knew that there must be some sort of watch-dog activity on technical matters, but would a group as large as you suggest be effective? Say they did detect some strategic development. What could be done to counteract it?"

"Precisely the point. Right now most government and military intelligence is used by the Executive branch—that is, the Secretary of State and I try to adjust foreign policy to accommodate it. That has not been enough. It's too passive to assure the nation's safety. This group will be prepared to take active technical countermeasures. For instance if a new type of atomic bomb were developed by an enemy, it might be necessary to try to sabotage the effort. For this reason it seems to me this new outfit will need an operational branch that would be prepared to go into other countries to handle such assignments."

"You mean sort of scientific cloak-and-dagger work?" Silverman almost smiled.

The Chief Executive looked directly at Silverman. "Exactly. And I propose to make you their director."

The leather hissed slightly as Silverman sat back in his chair. Then the room was completely silent.

Politically Silverman agreed with many of his fellow scientists. He felt that without astute critics, the system would die, as Joyce Cary's Gulley Jimson had put it, "of fatty degeneration of the brain." But he was firmly loyal to his country and grateful for the haven it had provided for his wife, Rachel, when she had fled from the Jewish persecution in Austria before World War II. His political activity had consisted of some letters to his congressman, the occasional lending of his name in support of liberal causes he felt strongly enough about, and paying Rachel's dues to the League of Women Voters.

Now the President was asking him to leave his academic haven of noninvolvement and actually become part of the inner circle of government, to do some of the nation's dirty work, to become, in fact, a chief spy.

The President had sat and watched as the scientist absorbed the implications of his request. He knew that this man was of the breed and generation of scientists who considered their craft as a pristine search for truth completely divorced from political uses. These men had been shocked at Allan Nunn-May, Klaus Fuche, and Bruno Pontecorvo. To them politics and science were and should remain separate disciplines.

But the President also knew that the lines were no longer so clearly drawn, that national survival in a technical age had come increas-

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ingly to depend on technical superiority, and that technical spying was becoming as necessary as military spying once had been. He had Silverman down for a two-hour time slot that day, and he did not intend to waste it. Science Processing was born before this visitor left the office.

The President was a convincing man, Silverman remembered as he locked his desk for the night. A very convincing man.

IV

Leigh and Van der Pool, meanwhile, walked slowly down the stairs and out into the still-warm air. Both were silent, lost in their own thoughts, walking slightly apart—the tall, fair Dutchman and the huskier, dark-haired American. They reached the tarmac of the parking lot and absentmindedly strolled to the red Triumph. Suddenly Van der Pool realized that he was outside and that John was standing beside him.

"Say, Leigh, won't you join Pat and me for dinner? I'm afraid not much breaks the routine up here. My wife would never forgive me if I let you slip away. Besides," he lowered his voice mysteriously, "if you're going to have to learn radio astronomy in a week, you can't risk too many meals at our cafeteria. I suspect our cook of being an enemy agent."

John laughed. "I'll keep it in mind. I'd enjoy having dinner with you, but hadn't you better warn your wife first?"

"That shows you're a bachelor, Leigh. By the time we've had our drinks, a smart woman nowadays can thaw out a dinner fit for a king. But you're right. She may be working on her new painting. I find her work clothes quite fetching, but she'll raise quiet hell with me if I surprise her with guests before she can get out of her jeans."

Van der Pool returned quickly from the office where he'd gone to telephone. His tall figure striding across the parking lot reminded Leigh of Ichabod Crane for the Dutchman's clothes and hair seemed to fly about in the still air quite apart from their owner's movements. His big face was smiling. "All set. Can you squeeze me into that car, or shall we walk?"

"Might as well drive. Come on, you'll fit."

The Triumph wound a mile or so down the mountain into the tiny village that housed the personnel of Sunseek. It looked cozy with the lights glowing into the evening dark. The houses were square cement-block affairs and would have been dull had they not been painted in soft blues and pinks and yellows. Some yards had yucca sending tall spikes of white blossom into the air. Other gardens were planted with zinnias and geraniums, and remarkably healthy roses climbed over most of the doorways. The

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damp smell of watered grass filled the air for as soon as the sun went down the sprinklers on all the lawns were turned on.

Van der Pool directed Leigh to pull into the driveway of a light-blue house with a white climbing rose in front. Pat met them at the door. She was as dark and petite as Jan was fair and tall. Her black hair was pulled up into a bun high on her head and she wore three-inch heels on her shoes, but still she barely reached her husband's shoulder. John saw why Jan had spoken so affectionately of his wife. She had the sparkle of animated intelligence in her face and the warm friendly smile that in a more settled profession Leigh himself would like to come home to. Apparently the isolation of their life didn't get her down. It was enough that she and Jan were together.

"Welcome to Sunseek, Dr. Leigh. Come on in and have a drink."

She led the two men into a room bright with Mexican rugs and handsome teak and black leather furniture of Danish design. On the pure white walls hung large abstract oil paintings in the pure primary colors of the native rugs. In a corner was a huge ceramic fireplace from South America.

Pat disappeared into the kitchen beyond while Van der Pool started mixing large gin-and-tonics. The house was filled with a promising, faintly Italian aroma, and the two men sat to savor it and their drinks.

"Sunseek is a pretty self-contained little place," Jan explained. "We have a bank, commissary, and gas station. A laundry truck picks up dry cleaning once a week. And they show the latest art films at the community center every Friday. The children ride a bus to school twenty miles away, but they get used to it. And there's always the trusty Sears catalog."

"Sounds like you never have to leave home."

"It might seem that way, but we usually go into El Paso, or Juarez, about once a week."

"Isn't that at least ninety miles away?"

"Everything is at least ninety miles away from everything else around here," Van der Pool smiled. "One gets used to the driving. In fact Pat and I thought we might all eat a quick supper and then go into Juarez to hear a Mexican folk singer at one of the nightclubs. Everyone says he's very good."

A large Scalpoint Siamese with huge, crossed blue eyes stalked into the room. He looked at John disdainfully and climbed on to the wide windowsill muttering his disapproval of all strangers, and of this one in particular.

"You'll have to forgive Yang. I'm afraid he's not used to new faces any more."

Patricia's head poked through the doorway. "Dinner's ready."

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The manicotti was delicious and the Chianti perfect. The talk soon drifted to painting, obviously Pat's second love next to her husband. "My paintings are not strictly non-objective," she explained. "I've tried to paint contrasts, because to me it seems that all great masterpieces get their impact from contrast—light against dark, warm against cool, and so forth. Perhaps we can represent other contrasts with painter's tools." She turned to the large painting hanging in the dining room. It was dark umber washed over white canvas. An impasto pattern of calligraphy in black ran through the umber wash. Almost in the center a glowing cadmium yellow rectangle shone against the dark.

"Say, for instance, we let the dark umber with its mysterious writing represent death and the light yellow, life. You see how they balance while they contrast—how if you take one away, the other loses its character?"

Leigh nodded. "I wonder if that's why I seem to know so many scientists married to artists. Perhaps the facts need some poetry to complete them."

"Perhaps," Pat replied as she exchanged an affectionate glance with her husband. "I never thought of it that way." Then suddenly she laughed at herself. She knew that she tended to be pedantic about art and had to watch lest she monopolize conversations. She turned the subject to Leigh's interest in radio astronomy, her curiosity just under the surface. As Jan had said, visitors were rare in Sunseek.

"John's here for a cram course in radio astronomy and I'm going to be his teacher," Van der Pool explained.

Pat turned to her guest. "Good luck, John. You know, Jan's not really the teaching type. I think that's why he likes to work here at Sunseek. It's really too bad Sontag isn't still around. He really preferred teaching. In fact I suppose the remoteness and lack of contact out here were what drove him over the edge."

"'Over the edge?' That sounds ominous." Now John was curious. "Who was Sontag? What do you mean 'over the edge'?"

Van der Pool supplied the answers. "Richard Sontag was, or rather still is, one of our staff astronomers out here. He'd had quite a successful career as a university professor until he got into some trouble over academic politics. He was one of these firebrand liberals who advocated instant action on any cause. Well, in one case he seems to have got on the unpopular side of some tenure scrap. He took so much criticism from his colleagues that he got mad and quit. Out here we thought that the personal friction would go away. It didn't though, and several weeks ago, maybe because of overwork on this project, or

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perhaps because he was basically unstable, the fellow had a nervous breakdown. He had to be sent to a rest home in the valley for observation. It was strange though. I never really thought Sontag was the type who'd crack up. After all, most astronomers are used to overwork and isolation." He paused thoughtfully. "It was a strange case."

Van der Pool seemed eager to change the subject. He glanced at his watch and pushed back abruptly from the table. "Say, it's getting late. Perhaps we'd better skip dessert and start now for Juarez."

"Why don't we take my car? It's the least I can do for such a delicious dinner," John suggested.

The Van der Pools soon gave in to this suggestion. Like most of the non-sports car-owning population they secretly cherished the idea of tearing off to town in something lowslung and daring.

The two men sat in the front bucket seats while the tiny Patricia squeezed into the small back sat. At first as the little car roared down the mountain, the two Van der Pools clutched their seats. Inwardly they both began to wonder what had made them want so to ride in this death bomb. At each turn Leigh would dash down to the curve full tilt, brake, and skid to within inches of the guardrail, and they could hear rocks crashing down the steep slopes at the edge of the road.

Jan Van der Pool cringed and was silent until he could stand it no longer. He cleared his throat. "On the way up you might not have noticed but off to the side of this road the drop is almost sheer for five hundred feet."

"Oh, this car hangs beautifully on the curves," Leigh replied over the roar of the engine as he accelerated down a fairly straight stretch.

Jan tried a weak appeal to Leigh's Scotch ancestry. "Don't you find the skidding wears the tires down much faster?"

Leigh had two answers to that question—one was true and the other was the one he gave to jittery passengers who always seemed overly concerned with his tire bill. The true answer, of course, was that the skids were part of the fun of owning a car like his, and in his line of work, you took your fun where you found it. "It's true that the tires wear down faster, but the cost of the tires per mile is a relatively small fraction of the per-mile cost of running a car like this. Look at it this way. For a person like you, the net savings in time is more than the cost of the tires."

By this time they were down in the valley on the long, straight road to El Paso and Juarez. Here Leigh pressed gently on the throttle and the Triumph hit eighty-five with ease. By this time the two passengers had realized that their driver was definitely not of the Sunday

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or garden variety, and anyway down here they pushed their own aging Ford to its limit. Their fears faded and again they began to sound like potential converts. "John, this is a marvelous car." Patricia sat relaxed with both forearms resting on the backs of the front seats. "I know it's rude to ask, but about how much does a car like this cost?"

"Normally about the same as a well-equipped family sedan," Leigh answered. "Of course they're not the same thing. In this car there's no space for lots of passengers or much luggage. The ride is harder as you may have noticed, since the car is designed to corner tightly. No," John grinned happily, "they're not the same thing at all."

Patricia was becoming enthusiastic. "Oh, Jan, for going into the city this would be just the thing. We don't usually have passengers. Let's get one of these. Maybe we can swing keeping the station wagon for my paintings instead of trading it in like we thought."

Van der Pool remained the practical husband. "Now just a minute, Patricia. I think I detected a clinker in that statement of John's about cost. Leigh, what do you mean when you say 'normally' about the same price as a sedan? I suppose we could afford such a car, but not if they charge extra for everything from the steering wheel to the tires. I've been stung on that before."

"No, that's not what I meant. You could buy a normal sports car of this type for the price of a more conventional car. This particular machine, however, is not a normal sports car. Since I travel extensively for them, the company gives me a car allowance. We decided to make certain modifications on this model. Occasionally I have to make special demands on it so we reinforced the body to make the walls much heavier than those of a normal car. The top is not canvas but metal and is hydraulically operated. Because the car is heavier we put in a more powerful engine and special springs to take the extra load. Right now you could take the car and drop it off a building several stories high, and it would almost bounce."

Almost as if to make good its owner's boast, the little car suddenly sailed off into space as though the roadway had been pulled out from under it, then moments later hit bottom and shot up again.

"Blast these dips in the roads here. I can never get used to them," Leigh said.

"They're for drainage," Van der Pool explained. "You'd never believe it, but it really does rain out here sometimes. And when it does it really pours. Water drains off the desert like a shower-room floor and any little crevice becomes a raging river. It's cheaper to pave these dips than to build a bridge

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over them for the few times a year they're full."

They chatted companionably on about the desert and its ways—the albino rattler John had seen that morning, the sudden changes in temperature with the coming and going of sunlight, the fiery temptations of the delicious New Mexican foods, and in no time at all they were checking into the border station that divided the city of El Paso, Texas, from Juarez, Mexico. They drove slowly across a bridge teeming with pedestrians from both countries. Down below the mighty Rio Grande trickled disappointingly along with scarcely enough water to reach the knees of the little Mexican urchins who with the coming of daylight would stand beneath the bridge calling to the passers-by to throw them pennies. Ahead the lights of Juarez flashed brightly.

As the Mexican guard waved them into his country, Van der Pool had an upsetting thought. "My gosh, John, I forgot to warn you about car insurance. Your policy probably doesn't cover you here."

Leigh smiled. "Don't worry. I have a very general plan which covers me almost everywhere." It sounded very reassuring, but actually John himself had had a thought far more disturbing than the lack of liability insurance. He had not reported to the office that he was going across the border—a strict rule every time he left the United States. A nerve in the back of his neck tingled warningly and he cursed his absentmindedness.

"This is a very easy border to cross," Van der Pool's voice broke into his thoughts. "As long as you don't go more than about ten miles inside Mexico, they let you go freely. Beyond that point you have to make visa arrangements. Coming back our customs men seem most interested in how much liquor you've bought so they can make you pay the tax. They can be quite unseemly about a bottle of Courvoisier you forget to declare, yet the smugglers seem to get a good bit of dope, or counterfeit currency, through."

Leigh nodded. He remembered his adventures with an enemy "A" bomb smuggled through these very gates as he watched the faces passing along beside his car.

The street was very busy. Leigh was always amazed by the night life in this border town. Down the street there were a hundred nightclubs interspersed with gift shops and liquor stores. The traffic was frightful and a kaleidoscope pattern of many-colored humanity constantly shifted around them. Van der Pool pointed out the nightclub where the folk singer was playing. It was a block or so farther down the street. "You can just see the sign down there, on the left."

"That's great. But it looks as if I'll have to fold the car up and

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put it in my pocket if we want to get anywhere near the place."

"That used to be almost true," Jan replied. "But a few months ago some El Paso real estate man realized Juarez's most pressing problem and decided to fix it. You see that tall building over there? It's a parking garage, the first in this part of Mexico. It's very convenient to the nightclub area and with luck we'll still find a place there."

Leigh headed the Triumph into the entrance of the garage and received a ticket from one of the attendants. The structure was one of those mazelike arrangements in which one drives the car up a narrow, one-way street to higher and higher levels. The cars were tightly parked and every place was filled until the very top floor. Here they finally found a slot and pulled in.

The men walked over to the edge and looked down over the single rail laced between the concrete girders. The rail was all that divided them from the night air of Juarez. *What a place to give someone a quick shove,* Leigh thought to himself and almost unconsciously glanced over his shoulder.

Pat was there, hanging back, a little wary of the unprotected height, and as the men joined her gave them a little nervous smile, ashamed of her fears. She was glad when they were on the street again among the swirling crowds.

They made their way slowly along the busy street. The big Dutchman, much to his embarrassment, was propositioned by a big-eyed girl still in her teens. A grubby-looking man called out to them asking if they wanted to see some "feelthy film." Dope peddlers were fairly obvious with their trade under the reddening glow of the bright signs of the nightclubs.

When they were finally settled at their table in the Club Martinez, Jan tried to explain to his guest the nature of the city they were in. "You have to understand the special nature of Juarez. The metropolitan area of Juarez-El Paso is bigger than most people realize and many of them never see the lovely homes that have been built here with their walled gardens and bougainvillea and roses. Juarez would naturally be a night-club town, since most of these border towns seem to be. But in addition there are the large military bases across in Texas and New Mexico to supply potential customers. It's also a favorite spot for quick Mexican divorces as you probably know if you have followed the movie-star gossip at all. But some of the places have good shows, and besides," he added with a shrug, "we don't have any place else to go."

"Don't worry about my sensibilities, Jan," Leigh smiled. "I was stationed here briefly when I was discharged from the Army at Fort

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Bliss. There was a sort of romantic story among the men that very poor Mexican families sent their most beautiful daughters up here for a year of prostitution to earn dowries for the family. I've often wondered what happened to the girls when they went back home—if they ever did."

The waiter brought their drinks just as the dim lights became even dimmer, and a spotlight was focused on a single wooden stool on the tiny dance floor. The folk singer entered with a much-used native guitar. He seated himself on the stool, struck a minor cord on the guitar and began to sing. His face creased with the troubles of the peasants of the whole world as he sang their work song, their ballads. Part of the songs were Mexican, sung in his native Spanish. Others were protest songs in English, heavily accented, about the world of the "wetback" and his struggles to make a living picking cotton across the Rio Grande in Texas. The man was genuinely good and the audience clapped and clamored for more.

But finally the young Mexican put down the guitar and mopped the sweat from his dark face. As the house lights came up again John was surprised to see the singer weave his way through the tables to theirs where he made a slight bow to Patricia. "Aren't you Pat Lynkowski from Carnegie Tech?"

Pat gave a delighted laugh. "It's Van der Pool now. I wondered if you would recognize me. What in the world are you doing in Juarez?"

"You know a teacher's salary, Pat. We've got to do something to make ends meet during summer vacation. Though I suppose some of the PTA might have a stroke if they knew how I spent my summers. I have a great time here."

"Jan, Dr. John Leigh, this is Raoul Ramierez. We went to school together in Pittsburgh." She turned to the two scientists who had been sitting in surprised silence. "Raoul was studying for his Master's in Musicology while I was getting mine in painting," she explained and then turned to the singer. "Tell me what's been happening to you. I haven't seen you for ages." A chair was pulled up for Ramierez and soon he and Pat were deep in discussion of what had happened to whom. The poor unfortunate peasants were forgotten as Leigh and Van der Pool exchanged amused glances and soon became absorbed themselves in a discussion of a mutually interesting article in last month's *Science*.

Regretfully they decided at last that they must return to Sunseek and went to claim their car. There was still a lot of movement on the garishly lit street, but inside the parking garage it became darker as they wound their way up to the sixth floor. Patricia gave a little shiver and snuggled closer

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to her husband. "*Brrr*, it's dark up here. I hope some thug doesn't knock us on the head and take our money." Leigh's senses, alert out of habit, probed the dark. All seemed quiet. They found the car safely locked up where they had left it. The metal top had been pulled up to discourage theft, and now Leigh lowered it so that they could have a better view of the city on the way home.

The three piled into the little Triumph. Leigh carefully backed out and started down the spiraling ramp to the street. From behind him he heard the muffled noise of a heavy car being started up. *Funny*, he thought, *I'd have sworn we were alone coming up here. The crazy fool's forgotten his lights. They'll kill us driving like that.*

Suddenly the little car was bathed in the glaring light from a searchlight. It was mounted on the side of the heavy black sedan hurtling down the ramp behind them. *My God! It looks like they intend to.*

"Down. Down in your seats," Leigh yelled at his amazed passengers. "Someone's after us." The tune of the powerful engine changed as Leigh shifted the car to low and roared down to the fifth level of the garage. The heavy sedan was only fifteen feet behind them and bearing down. John took the next curve tightly and scraped one of the red fenders. Then he saw his chance. At that landing the path divided and there was a lane leading back up to the sixth floor, the other continuing down, and a blank turnaround.

John pulled sharply to the side and tore up to the sixth floor again. The car in back lost several feet in the maneuver, but doggedly followed its prey back up to the sixth level. Soon the heavier car was only a turn behind them again. Leigh could see in his driving mirror a man lean out from the right side of the car and sensed rather than saw the bright flash from the gun. The man's aim was ruined by the spiraling ramp and the speed of the cars. *But it sure as hell gives us something to think about*, Leigh thought grimly as he tightened his grip on the wheel. "Stay low and hang on," he hissed, "we're going to skid."

This time at the intersection he turned quickly and braked hard into the blind turnaround. The Triumph came to a squealing stop with the bumper four inches into the Juarez night air. The big, black sedan didn't pause at all but charged blindly after Leigh. The bigger car's wheels, turning on their larger radius, made the hunters pass just to the side of their quarry. Leigh turned away from the look of horror on the gunman's face as the car crashed through the protective railing, hovered momentarily on the edge, and then fell, crashing four stories into the little side street below.

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It was no time to savor victory. Leigh's only thought was to get the hell out of there as soon as possible. He pulled out, flashed a grim smile at his passengers who were just cautiously raising their heads to see what had happened, and turned the Triumph into the ramp to the third level.

Over the roar of his own engine, Leigh detected a new sound. He must be dreaming. The black sedan was coming up the same ramp to meet him. Had the crazy machine shaken off the dust of its fall and come back after them?

John slammed the throttle to the floor of the Triumph. "Get down," he yelled again. With a wild screech the red car slipped by the black one through the slight space left by the landing. There was a tearing sound as his heavy rear bumper caught and tore the fender from the sedan.

As they flashed by the driver and the side man jumped from the sedan and started shooting at them, but they were already clear of the line of fire.

Leigh headed downward toward what he hoped was safety. They had reached the second level when below them he saw the third car. It was pulled up across the entrance way, blocking it completely. Five men poured from it. One had the parking attendant pinned. The other four waited expectantly with machine guns at the ready. It looked like the trap at last had closed. Leigh looked wildly around him. The second level, he saw, was like the fourth. There was a small blind turnaround where the ramps divided. He spurted past the ramp leading to the ground floor. There was a burst of gunfire. Just at the edge of the turnaround, Leigh lightly touched his brakes. The Triumph crashed through the barrier and sailed off the edge. They landed at a dead stop several feet past the wreckage of the first sedan. He had gauged his momentum just right to get past it.

He glanced over at the Van der Pools. They were white and wide-eyed. "Don't panic now. I'm going to turn on the siren and try to make it out of here. If we wait for questions, there's no telling what will happen. It seems unlikely that there are more of them, but we can't take the chance."

Leigh reached under the dashboard of the Triumph. There was an ear-splitting wail from under the hood and four previously inconspicuous lights on the front and rear began to flash on and off. He wheeled the car on to a narrow side street and turned back toward the border.

By this time Van der Pool had recovered his wits. "About a quarter of a mile before the border station, you'll have to cut back on to the main street. The traffic will be backed up for several blocks. You may be in trouble."

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"Here's hoping the siren pulls them off." To Leigh's relief it worked. He could see the line of traffic pulling to the side as they heard the screeching of the siren. He tore straight down the middle of the road to the very edge of the border. With a wrench of the wheel that brought a squeal of protest from the tires, he broke into the line in front of a puzzled young couple in a light yellow Mustang just about to pull up to the gate.

The Mexican border guard looked numbly at the screaming, flashing red apparition before him and shook his head. The police radio had reported trouble in the middle of town. Now this strange car had broken the law. Perhaps Juan Sanchez's moment to be a hero had come. He slammed down his heavy steel gate across the nose of the Triumph.

"Dammit!" Leigh muttered and pulled a hundred-dollar bill from his money clip. "Quickly," he ordered the puzzled guard. "Open that gate. Terrorists are after us. We must pass!" The combination of the money, the siren and official-looking lights on the red car, and the command in Leigh's voice worked. The gate was flung up, the red car sped across the bridge to the American side, and Juan Sanchez did become a hero to at least three people that night.

A small crowd of guards had gathered on the American side of the bridge. He showed the one who seemed to be in charge his government card, was escorted to the customs station, and allowed to use the phone. He dialed Silverman's special number at Sunseek and guardedly explained the situation to his boss.

There was silence on the other end of the line while the head of Science Processing digested this new development. Finally he gave his orders. "Someone's watching either you or Van der Pool very closely. Since you got here so fast from the East coast I don't think they were after you. It seems more likely that this was a fix on Van der Pool. I want you to get him back here on the site as soon as possible."

"With pleasure, Professor," Leigh agreed. He hung up quickly and he and his shaken passengers headed gratefully for Sunseek and safety.

V

A lonely cricket chirruped noisily in the guest house at Sunseek. The exhausted man lay on his back in the dark room trying to ignore the tight knot in the back of his neck and the occasional twitching of his tired legs. The chirruping grew louder and louder, filling the room with bright chips of sound.

"Will you shut up, damn you!" He reached under the bed, got a slipper, and threw it in the general

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direction of the noise. The cricket stopped.

Now the silence was almost complete. Bars of moonlight slipped through the government-issue venetian blinds and lay across the rough gray blanket covering the figure on the bed.

Leigh found himself actually missing the cricket. The noise, after all, had been a friendly sound. Now he became conscious of the woolly, institutional smell of the G. I. blanket. He disliked the odor. It reminded him of hospitals—Army hospitals—like the one in Japan where they'd sent him after his first brush with disaster as an employee of Science Processing, Inc.

The office had been informed that a famous Chinese scientist wanted to defect from the Reds. It was a great opportunity for the West, a chance to gain first-hand knowledge of the closely-guarded technical advances behind the Bamboo Curtain. Leigh had never seen the man—only a few blurred telephoto pictures of him on the street. But somehow the scientist had managed to get out microfilm dots of technical information into Hong Kong as a show of good faith. Now the United Staes was to repay him with asylum and a chance to work at an American laboratory.

How the scientist had managed to smuggle himself into the troops sent to fight in North Korea, Leigh did not know, but he had arranged a meeting in a certain deserted peasant hut at midnight. John was to get the defector back to American lines and hopefully to safety.

He'd seen the huddled figure in the dim light that always affords some vision even on the darkest night. He hissed the man's name and got a quick answer in halting English. "Have you any identification?" Miraculously the man had produced a packet of identification papers. In the dim light Leigh could only barely make them out. Brighter light was too dangerous, so softly he quizzed the man with questions only a scientist could answer. The man replied slowly and with some difficulty with his English, but his tone showed that he was insulted by Leigh's suspicions. He was obviously impatient to be off to the American lines.

Leigh pressed on with the questioning. "Which has the higher atomic number—uranium or polonium?"

Loftily the Chinese answered, "Polonium, of course." There was a short scuffle but Leigh had the element of surprise on his side. The Chinese was the victim of some well-learned judo. Quickly the American was out of the hut and running low towards his own lines. But the noise of the struggle had attracted an enemy patrol. The grenade made a brilliant flash in the night and the hut was gone.

John had hit the dirt, but not fast enough to avoid the flying

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debris. Painfully he had managed to reach the Army patrol which had been waiting for him to bring back his prize. Many months later the file on his first assignment for SPI was closed. Word finally reached Washington that the real scientist had been executed for spying before Leigh had lift for Korea.

Silverman had called the young man into his office after the incident. "You see now why we needed a scientist. That impostor could have bluffed someone else. He might even have made his way into the scientific community here. Only a scientist could know the questions to ask, and how to judge whether wrong answers were reasonable holes or indication of fraud. Who knows what damage he could have done before he was caught?"

But Leigh could not forget wondering what the hell death had to do with the years he'd spent studying to be a scientist. He'd tried to puzzle it out in that Japanese hospital while they fixed up his damaged ribs.

Perhaps the connection had begun on a warm afternoon the summer before. He'd just done a rather sophisticated doctoral thesis having to do with measuring the mass of the K meson in a cloud chamber and the paper was ready to go to the typist. Leigh had been approached by two universities—one small but growing, the other large and influential. Either would have been all right—dull, but all right. Maybe he could put enough by for a bit of really exciting travel by next summer. With these thoughts in mind he had strolled over to the Physics Building from the cafeteria. He had an appointment for an interview with the assistant head of the department. *Maybe Dr. Allen will have some suggestion,* he hoped.

Allen's office was posh with carpeting and air-conditioning. Leigh knew that a lot of the "breaks," both good and bad, happened to graduate students here. But Allen liked him and had been patient with his scholastic ups and down. Leigh in his turn admired the way Allen handled a complex job with unshakable fairness. He trusted his judgment more than he did most men's.

"Well, Mr. Leigh, almost through with us, I hear." Allen peered over the tops of his rimless glasses, one of the few affectations he allowed himself.

"Yes, sir. I guess I'm finally ready to go into print."

Allen opened Leigh's folder which was lying on his desk. "Where to from here?"

John explained about the offers he had had. "Professor Knowland feels that they're both good opportunities. What do you think?"

"I agree. Your record shows that you could handle either job." He cleared his throat. "It also

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shows that you nearly quit school because you found the academic life, er, 'dull'."

John shifted in his seat. He'd supposed that that would catch up with him eventually. "I guess I did. Life wasn't running very smoothly for me then. There were some personal problems.'"

"Having to do, I believe, with the death of your father?"

John was surprised at Allen's memory. "Yes. As you know, Dad was an inventor. He owned several patents on electrical devices. He'd done very well without a college degree, but he felt that times were changing. He wanted very much for me to have the formal education he'd missed out on.

"Well, shortly before his death he had devised a miniature triode. He was really excited about the thing and put most of his money into producing it. Then transistors were perfected and the triode was about as salable as a buggy whip. Dad had his fatal heart attack shortly after that."

Allen nodded sympathetically. "Is that why you joined the Army?"

"Partly. Our finances were pretty low and physics seemed kind of futile after what had happened to Dad."

"Your record shows a stint in Army Intelligence. Was that exciting enough for you?"

Leigh shrugged. "If you can call tracking down deserters exciting. I guess I caught one bad-check artist and maybe an AWOL drunk or two. It had its moments, but most of it was paperwork." He grinned. "About the most valuable thing I learned was how to type."

Allen smiled back. Then his face became grave. "You may wonder, Mr. Leigh, where all this is leading us."

John had been enjoying the luxury and the air-conditioning. He hadn't, in fact, realized that the discussion was "leading" them anywhere. "No, sir."

"I must ask that the rest of our discussion remain confidential."

"Sir?"

"You are not to discuss what I am about to say with anyone."

"Well, all right." John was puzzled. "May I ask why not?"

"Because I have been asked by an old friend of mine to approach you about a rather special type of employment. He has seen your file and feels you might qualify.

"Are you familiar with the Silverman tables on inelastic neutron scattering cross sections?"

"Yes."

"Perhaps you also know that Professor Silverman once taught here at the University. The tables were only one facet of his work. He was an excellent experimentalist and a valuable teacher."

Leigh waited.

"You may also have noticed that he has not been actively involved in physics recently. This is because he has left the academic world

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you find so dull and gone to work for the government. His specific job is secret. I can only tell you that he needs a young man who is physically fit, has advanced technical training, and finds most ordinary jobs, shall we say, unexciting. You were once considered for an Olympic berth on the swimming team. Are you still keeping up with your swimming?" John nodded. "If you're interested, I'm to call Silverman in Washington and set up an appointment at his expense."

Leigh went to Washington. Silverman outlined the job. And it had been a damned sight more exciting than catching AWOL drunks, or pounding elementary physics into engineering students whose interests ran more to well-engineered females than to Newton.

Maybe someday I'll even find out what the hell it does have to do with the mass of a K meson, Leigh repeated what had become his standard joke with himself. He rolled over on his side and counted very slowly backward from one hundred in Spanish. The cricket took up his song again but the man on the bed no longer cared. He was asleep.

VI

The smell of tobacco-saturated tweed hung somewhere over his left shoulder. Silverman was checking his progress again. *A year's computer course in two weeks and he's still not satisfied. Well, Pat was right about one thing,* Leigh grumbled to himself as he reached for another stack of computer journals, *her husband's not the teaching type all right. He'd scare a college freshman witless.* For the astronomer had forgotten more about computers and their related mathematics than Leigh had ever known. On the premise that he was making things clearer, the Dutchman had launched into long, involved histories of each day's lesson. These lectures would begin simply enough and then degenerate into language so esoteric that Leigh would spend half of each night pestering CARA for a translation.

To make matters worse, Jan had followed Silverman's orders to keep Leigh as ignorant of the physical setup of the site as possible. The office where they worked had one window which looked out into thick pinewoods. Their lunch was brought in as was the reading material they requested. Twice a day, Leigh was allowed to go to the large indoor pool where he washed his eyestrain away with a long, hard swim. He could leave the site, but Jan, or Silverman, always drove him to the gate where his car was parked.

Suddenly Silverman's voice broke the silence. "Van der Pool tells me he thinks you're ready. The dry run will be tomorrow. We'll have our planning session at two this afternoon."

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Leigh looked up from the treaties on memory systems he had been trying to work up an interest in. Silverman chuckled to himself. *Looks just like the dog when I put on my coat and pick up her leash. I guess he has been cooped up rather long.*

Leigh tried to look properly serious, but a big grin came out instead. "Fine, I'll be there."

The meeting was brief and absolutely secret.

At 4 a.m. the next morning the three men who had been present stood in a dirty airplane hangar miles from the laboratory. Leigh, dressed in a camouflage coverall of green and brown was poking skeptically at an ancient-looking bi-winged crop duster with two open cockpits. "Will it fly?"

Silverman and Van der Pool moved from the corner, where they had been talking softly, into the pool of light from the single bare bulb. "You'll have to ask Hank when he gets here," Silverman answered. "He claims it's safer than a jet."

Leigh adjusted the parachute on his back and then plunged his hands deep into the coverall pockets. "I still don't think it's fair not to have any more information about the site. I know less about Sunseek than I'll know about the Russian setup. This run isn't dry, it's parched."

Silverman smiled benignly. "Ah, but you won't have to practice your Russian here. It all balances out."

"Now," he spoke briskly, "let's quickly review the plan again before the pilot gets here. The crop duster will fly you up to an orchard on the mountain that is nearly adjacent to the site. He'll go through the usual crisscross pattern of his work, sweeping in low on the orchard and actually dusting with insecticide. This will establish his reason for being there. As you know, planes aren't supposed to fly over the site, but if they see a duster there it will seem plausible.

"On one pass he'll break away from the pattern and dash directly toward the site very close to the ground to avoid radar detection. There is a small rise on the edge of the site behind the fence. You are to try to parachute behind it. If you are fast enough, you won't be noticed. Remember to pull the ripcord quickly. The duster will pull up just enough to give your 'chute time to open and break, but just barely. That way you'll be exposed for the minimum length of time.

"You are to hide during the day and at nightfall, move around to the big dish, try to get its bearing, then photograph it. Next go inside and attempt to get the master tape from the computer. When you get the tape, you will pretend to destroy the computer with the smoke bomb. This will give us a chance

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to see what sort of commotion we might cause in a foreign installation, and the security chief wants to see how alert his boys are.

"As we decided yesterday, your escape off of the site seems largely irrelevant since your technique will be so different in the main job. So as soon as you get the tape, get to my office as quickly as you can. There we will do a post mortem on the mission. But I don't want to be doing one on you. Don't allow yourself to be shot at. If you're caught, give yourself up. Show them your card, and ask to be brought immediately to me."

John nodded wordlessly and glanced down the road to where the lights of the pilot's car pierced the distant dark. Van der Pool leaned toward him and spoke urgently. "Remember, when you go for the tape, be sure to remove the master tape. That's the one containing the stellar positions. Don't confuse it with the monitor tape that controls the computer."

Leigh's answer was lost in the roar of the white Corvette that skidded flashily up to the hangar. A small, dark, compact man got out and ambled up to the scientists. "Mornin'."

"Good morning, Hank. Your passenger's all ready. Jack, this is Thomas Jefferson Patrick Henry Jones, your pilot for the morning. Good luck. Take good care of Mr. Leigh, Hank." And with that he

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nodded to Van der Pool to follow as he disappeared into the predawn darkness.

The pilot, perhaps overwhelmed at birth by his impressive name, was a man of few words. His passenger, who preferred night to day, and almost any time to early morning, was glad to sit in silence as Hank busied himself with a thorough inspection of his aging aircraft. When he had convinced himself that all was in order, he motioned to John to help him push the little yellow plane out onto the runway. "Dust in th' mornin'," he explained. "No-wind. Dew holds th' powder down." John nodded. "Ya'll jump when I slap th' side of th' cockpit. O.K., Jack?"

"O.K., Hank."

They climbed into the open cockpit and pulled goggles down over their eyes. Hank started the motor. To John's surprise, a self-starter had been installed into a craft that had surely not been born with one. Leigh still had his doubts that the old crate would ever make it off the ground, but at the last minute Hank pulled into the air just over the telephone wires at the end of the runway.

Once aloft, Leigh relaxed to enjoy the ride. The air rushed past his head and he had the silly feeling that he was acting in an old World War I movie. They passed over the desert and climbed slightly to the mountains. Soon the orchard appeared below. To the east a faint gray light was beginning to show. It would not be long before the sun would be blazing and John wanted to be down safely among the pines inside the fence before that happened.

The duster went into the familiar pattern over the apple trees. He dived at the orchard like a gull spearing a fish. Twenty feet above the tree tops he pulled out sharply and opened his dusters, releasing the whitish cloud of insecticide. They flew to the very end of the orchard and Leigh winced as he saw Hank fly straight at the power lines crossing in front of them. Just when he'd nearly lost his passenger to heart failure, the pilot pulled the little plane up, flew back and made another dive at the orchard. John began to feel that the rest of the operation would be duck soup if he ever survived the acrobatics of the maniac at the stick of the yellow plane.

"They're all nuts," he muttered to himself as he watched not far away another bi-plane, a red one, going through the same swoop-and-skim pattern. As he watched, the red craft suddenly disappeared. *My God! He's crashed.* Leigh thought. Suddenly he saw the plane far in the distance heading for what he assumed was home.

Then he was aware that Hank had also departed from their own rhythmic pattern and was headed for the red warning lights that

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dominated the landscape on the mountain. He climbed quickly and almost sent the plane into a deliberate stall as Leigh got ready to jump. Hank's hand came down against the side of the yellow fuselage. John had just time to catch the circled thumb and forefinger good luck sign Hank flashed him as he left the wing.

The parachute jolted him as it billowed open and then the ground came up abruptly. He had only time to try not to break anything and roll with his fall.

In a few minutes he had recovered his breath, stowed the 'chute in the sandy soil and ruffled dried pine needles over his tracks. He could still hear the drone of Hank's bi-plane as it passed over the orchard, climbed, stalled, and turned. Not the first brave man to be turned to a mass of nerves after a trip with a crop duster, he thanked his lucky stars he was on the ground.

The sun was coming up fast now and Leigh quickly sought the cover of a stand of trees. His coverall blended well with the dappled sunlight filtering through the old pines. Several small thickets afforded ample protection and he chose one to wait out the day and check his equipment. The flies droned over his head as he ate the meal from his bag. A fat black beetle waddled over to get the crumbs. It was his last meal, for he proved lunch for a huge praying mantis of a startling chartreuse color. Van der Pool's lessons turned round and round in the waiting man's head. The heat of the day was making him drowsy. He drifted off to sleep.

The brush of a cool breeze across his face woke him suddenly. At long last the sun had swung far to the west and colored the mountains a fantastic purple. It would soon be dark. In moments Leigh was able to crawl from his hiding place and stretch his aching muscles. As soon as the tingling in his cramped legs lessened, he moved around the hill towards the big dish of the telescope. He could see the tiny warning lights around the edge of the dish quite clearly about half a mile away. The site seemed quiet and unsuspecting.

Methodically he set about making his observations. First he took sightings against the background of the sky, timing each one against his wrist watch. For each set of sightings he carefully recorded the numbers. Then he got out the camera and started photographing the dish, again recording the time each picture was taken. When he had completed that set of observations and photographs, he started to circle the dish. Two more sets would have to be taken so that triangulations could be made to determine the exact position of the antenna against the pattern of the stars.

He moved quietly, testing each step before placing his weight. The

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slim sliver of a moon cast strange shadows among the gnarled branches of the old pines. All at once Leigh knew that he was not alone. Was it extrasensory, or had he subconsciously recorded a slight noise or movement? He wasn't sure, but he knew that another human was in the woods with him.

Then he saw the man, creeping as stealthily as he among the trees. In the dimness he could see that the other had a pack about the size of a sleeping bag strapped to his back. The shadow of his face was grotesque in the moonlight. He was apparently wearing some sort of gas mask or goggles. Leigh remained motionless. The other seemed still not to be aware of his presence.

"Silverman's got a crummy sense of humor to throw a joker into the pack like this. I'll bet he had this guy parachute from that red crop duster I saw this morning." Leigh's eyes narrowed angrily. "Well, I'll take care of his little friend before he becomes a nuisance."

Leigh changed his course to bring him across the path of the other. The man in the mask continued on a fairly straight path toward the telescope. He was so intent on his objective that he still had not noticed the man crouching in the shadows where he soon would pass. Leigh's body tensed to spring.

Suddenly a siren shrilled, again and again, then another until the air was full of the warning. One of them must have tripped an electric eye and set off the alarm. "Oh, hell!" Leigh ran the few remaining feet to the other who was frozen for a moment in surprise. Before he had time to move, Leigh had brought the heavy camera down on his head. There had been no time for questions. He could hear the barking of the sentry dogs not far away.

He moved more quickly now. In several minutes he had worked his way up the mountain to the point where the entire six-hundred-foot dish was visible. He could see the control building sprawling below the twin towers that held the antenna.

Lying on his stomach in the woods, Leigh considered his objective. Bluffing his way through the front door was too dangerous with the sirens tearing the night air to shreds. There would probably be some pass system he'd foul up. He scanned the side of the building for a window to climb through. A small one on a dark corner of the building made a blackish square against the shadowy gray of the stucco. It was placed higher than the others along that side. "Probably a washroom," he reasoned. "I sure hope the door reads 'Men'. Wouldn't some little secretary raise a hell of a flap if she found a man in the washroom on a night like this?"

He charged low across the grass

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and in a moment had scaled the six feet to the window. The trusty camera served to smash the glass and he reached in and unlatched the window. Quickly he hoisted himself into the room. He slipped out of the coverall and wrapping it around his hand, smashed out the remaining glass in the sash and shut it so that it would show less. There were heavy footsteps in the hall. Leigh slipped into one of the privacy closets just as a man entered the room and turned on the lights.

The stranger started to wash up. Leigh could see through the crack in the door that the man wore a white coverall. But more important, he had pinned to it a distinctive badge with his picture on it. *Looks like I'll need one of those to move around here. I guess Mr. X will just have to lend me his.*

The man had felt the draft from the broken window and the last thing he remembered for a while was the open pane where the glass was gone.

Leigh dragged the man into the privacy closet and bound and gagged him. His coverall was a little big on the intruder, but at least Leigh had the badge which he inspected carefully. *Now if George Hawsley has the right kind of badge, we're in business. The picture doesn't look like me, but then* —he glanced down at the unconscious man—*it doesn't look like him, either. They never do.* He chuckled to himself. His own last badge picture had looked remarkably like Leonard Bernstein.

Out in the hall, he paused to get his bearings. It seemed best to go up to the front of the building for this back corridor seemed almost deserted. He passed the front door and saw with a twinge of regret for George Hawsley's head that he could have walked right in. There was a sign that pointed in big red letters to the control room of the telescope. But the most unbelievable piece of luck was a large, glass-enclosed map of the building floor plan.

Leigh stood casually in front of the map and memorized it as quickly as he could. Several men passed him without more than an incurious glance. As he had suspected, the organization was not so small that everyone was expected to know everyone else.

The floor plan showed that the computer and the control center lay at opposite ends of the cross of a T. Both rooms seemed to be quite large. The control room aimed the telescope and monitored the receivers. Any radio astronomers would be there. That meant that the computer would be run by computer operations personnel. He knew from experience that these people would be busy and preoccupied and hate interruptions like poison. People who work at night generally like to be left alone.

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Leigh shoved his hands into his coverall pockets and turned down the hallway to the computer room. Through the glass door he could see the layout of the room. The operations personnel of the computer had arranged it so that they were completely isolated from impatient users and their bothersome questions. The setup was much like that of a country postoffice. The work for the computer was placed in cubbyholes from which it was taken on the inside by the computer operators. Each user attached a stamped time card to his bundle of work. Then he shoved it into the little box where it was at the mercy of the operator's schedule and the temper of the delicate machine inside.

To one side of the boxes was another door marked "Computer Personnel ONLY." Apparently the operators found this intimidating enough for when Leigh tried the door he found it unlocked. He slipped quietly inside and watched silently the scene before him.

As always he found the control room of a giant computer at night an eerie place. To his modern eyes it always looked like some overdone movie set for a science-fiction thriller. But he mused that to an ancient Greek, put there by some chance, it would look more like a pagan temple to the goddess of knowledge. The chief operator did look a little like a high priest as he presided over the control console which sat on a raised dais. The console was about fifteen feet long and was covered with blinking lights. From one side stared the round black eye of an oscilloscope, bloodshot with flickering lines of green. On the floor around the console were scattered carts and tables loaded with magnetic tapes and decks of punched cards. Among these scurried the operator's two acolytes, following the instructions he called to them from the dais.

This main work area was lighted by large overhead fluorescent lights. At the perimeter of their glow, framing the work area, were the magnetic tape units. In deepest shadow at the end of the room stood more carts and the maintenance equipment for the machine.

The operators were completely wrapped up in their work and apparently had not noticed their visitor. He must use the moments until they did to try to figure out which was the master tape he had been sent to get.

At any given time many of the tape units were spinning, but after a few minutes' observation Leigh found the two which seemed to go through a regular pattern. The antenna, he knew, was probably scanning across the sky and the computer recorded the coordinates and redid the calculations to make the antenna parabolic every few seconds. One of the tapes must be the monitor that told the computer which job to do next and took care

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of the bookkeeping. The other recorded the important data. This was the one he was after. But which was which?

Leigh strained his eyes in the dim light. Both of the tapes seemed to turn with the same pattern and reel off the same amount of tape. But then he noticed that one of the tapes was occasionally rewound slightly. "That must be the monitor. Surely they wouldn't erase the data on the master tape by backspacing and writing over them. Or would they?" He tried to tell from the lights on the magnetic tape consoles. The monitor, he knew, was read into the computer since it gave directions, and the data tape was written out.

But from where he stood it appeared that the indicators were burned out. He saw that the operators watched the tapes themselves rather than the tape console. "Well," he decided, it must be the one that's not backspaced. Here goes."

He broke away from the shadows and strode up to the console where he addressed the chief operator in a firm, urgent voice. "I'm from Security. A man has got into the site illegally tonight. You must have heard the sirens. We have to find him. There is reason to believe that he came into this building and that he is a saboteur." The operator looked up in surprise. "We must search every room here. He may be armed and is probably dangerous. I want all of you to go over into that far corner out of the way during the search in case there is gunplay."

By now the operator had recovered himself and begun to protest. "That's impossible. If the computer stops, control on the telescope will falter."

"Impossible, hell! If this man isn't found, the telescope and you may be blown to bits. Move!" The operator and his men moved.

Leigh passed down the row of tape units on his "search." When he passed the one that he had decided contained the data tape, he quickly pressed the rewind button. Now he had to pace his movements so that he would arrive back at that point when the tape was fully rewound. The operators were beginning to ask questions of each other. Why didn't the damn thing rewind faster? It seemed to take forever. But by the time he had circled the room it was done. He stood by the unit containing the tape and pulled the smoke bomb from his pocket.

All three operators acted at once. They rushed him as he pulled the fuse on the bomb and threw it toward the dais. The thick, acrid smoke filled the room, choking the three surprised men coming at him. Leigh covered his face with the small mask he carried. He had memorized the path to the door and in a moment was out in the hall with the precious tape held inside the white coverall.

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This time when the sirens began to shrill they sounded in dead earnest. Leigh ran to the woods and cut through them to the Administration Building. Moments later he was at the heavy glass door. Now there was a burly guard blocking the way, but just inside Silverman was waiting and he signaled the guard to let Leigh in.

His boss gave him no greeting but jerked his head for Leigh to follow him up the stairs to the inner office of SPI. John was puzzled by the set lines at the edges of Silverman's eyes and the gruffness of his manner. He was, to tell the truth, rather proud of his night's work and bursting to hand over the tape.

Inside the inner office they joined Van der Pool and an even more serious-faced, tough-looking man in the uniform of a colonel in the United States Army.

"Leigh, Colonel Davis. He has something to show you."

"Come over here, Dr. Leigh." Davis motioned John closer to Silverman's desk. "What do you know about these?" He opened a vaguely familiar-looking brown pack and pulled out materials for making a plastic bomb, several fuses, and coils of electrical primer wire. He handed Leigh a pair of goggles which had been lying on top of the pack. They were infra-red night glasses.

"Well, I'll be damned. Where'd you get a setup like that?"

"From a surly-looking Russian the dogs found in the woods. He had one hell of a headache."

"You mean that guy I conked in the woods was a Russian? I thought he was some joker you'd put in the pack to liven up the game."

"He was a joker, all right," Silverman agreed grimly, "but another player slipped him into the game. The stakes must be higher than we thought for them to want to destroy the only other facility in the world which could hear that star. Now tell us exactly what happened from the time you and Hank took off."

Leigh recounted every detail of the night's work to his intent audience. At the end of his story he reached inside of the white coverall he still wore and triumphantly produced the roll of magnetic tape.

There was silence. Van der Pool picked up the spool and inspected it carefully. Then he looked at Leigh and shook his head slowly. The truth dawned painfully on his crestfallen student. He had brought them the monitor tape. The master tape was still safe in its unit in the computer control room.

To Be Continued

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ONE STEP FROM EARTH

The length of a step depends on how you measure distance—and on who's trying to step on you!

HANK DEMPSEY

Illustrated by Vincent diFate

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This landscape was dead. It had never lived. It had been born dead when the planets first formed, a planetary stillbirth of boulders, coarse sand, jagged rock. The air was thin and so cold that it was closer to the vacuum of space than to any habitable atmosphere. Though it was nearly noon and the pallid tiny disk of the sun was high overhead, the sky was dark, the wan light shining on the uneven plain that was unmarked by any footprint. Silent, lonely, empty.

Only the shadows moved. The sun paced its way slowly across the horizon until it set. Night came and with it an even greater cold. Silently the dark hours passed, the stars arched by overhead, until on the opposite horizon the sun appeared once again.

Then something changed. High above there was a tiny flicker of movement as the sun glanced from some shining surface, a motion where none had existed ever before. It grew to a spot of light that blossomed suddenly into a long tongue of flame. The flame continued, even brighter as it came close to the surface, dropped, hovering. Dust billowed out, rocks melted and the flame was gone.

The squat cylinder dropped the last few feet and landed on wide-stretched legs. Shock absorbers took up the impact, giving way, then slowly leveling out the body of the device. It bobbed slightly for a few seconds and was still.

Minutes passed and nothing more happened. The dust had long settled and the molten slag hardened and cracked in the cold.

With sudden sharp explosions the side of the cylinder blew away and landed on the ground some yards distant. The capsule bobbed slightly in reaction to this but quickly came to rest. In the area uncovered by the discarded plate were a number of small devices, all ringed about a gray plate, some two feet in diameter, that resembled an obscured porthole.

Nothing else happened for quite a while, as though some hidden internal device were marking time. It reached some decision because, with a distant humming, an antenna began to emerge from its opening. At first it projected straight out from the side of the capsule, until a curved section emerged and it began to slowly rise until it towered into the air. Even as it was erecting itself a compact television camera moved jerkily into view on the end of a jointed arm. It hesitantly changed direction until it was above the circular plate and angled down towards it and the patch of ground below. Apparently satisfied it locked into this position.

With a loud *ping* the circular plate changed color and character. It was now a deep black and it seemed to shift without moving. A moment later a transparent plastic container appeared, coming from the surface of the plate as though

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emerging from a door, dropping forward and hitting the ground, rolling over.

The white rat inside the container was terrified at first, knocked off its feet as the tube struck the ground and dropped onto its side. The rat rolled onto its feet and scurried about trying to get a grip with its claws on the slippery walls, climbing up, then sliding back to the bottom again. In a few moments it settled down, blinking its pink eyes at the gray wastes outside. There was nothing moving, nothing to see. It sat and began to smooth its long whiskers with its paws. The cold had not yet penetrated the thick walls.

The picture on the television screen was very blurred, but considering the fact that it had been broadcast from the surface of Mars to a satellite in orbit, had then been relayed to the Lunar station and from there sent to Earth—it wasn't really a bad picture. Through the interference and the snow the container could be clearly seen, with the rat moving about inside of it.

"Success?" Ben Duncan asked. He was a wiry, compact man with close-cropped hair and tanned leathery skin. There were networks of wrinkles in the corners of his eyes as though he had squinted a lot in very cold weather, or before a glaring sun. He had done both. His complexion was in direct contrast to that of the technicians and scientists manning the banks of instruments. Other than the few Negroes and one Puerto Rican, all of them were the fishbelly white of city dwellers.

"It looks good so far," Dr. Thurmond said. His degree was in physics from MIT. He was quite proud of it and insisted on its being used at all times. "Waves form fine, no attenuation, flat response, the trial subject went through with a one point three on the co-ord which can't be bettered."

"When can we go through?"

"In about an hour, maybe a little more. If biology gives the O.K. They'll want to examine this transmission on the first subject, maybe send another one through. If everything is in the green, you and Thasler will go through at once while conditions are optimum."

"Yes, of course, shouldn't wait," Otto Thasler said. Then, "Excuse me." He hurried away. A small man who wore thick-rimmed glasses. His hair was sandy and thin and he had a slouch from many hours over a laboratory bench so that he looked older than he was. And he was nervous. There was a fine beading of sweat on his face. Dr. Thurmond had noticed it, too.

"Otto is jumpy," he said. "But I don't think he will be any trouble."

"He'll be all right once we get there. It is the waiting that bothers people," Ben Duncan said.

"It doesn't bother you?" Dr. Thurmond was curious, but there

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was also a thin edge of malice to his words.

"Of course it does. But let's say that I have been over this waiting part many times before. I've never gone to Mars through a matter transmitter before, but I have been in some strange positions."

"I'm sure you have. Professional adventurer or some such." The malice was clear now; the distrust of the man who was used to giving orders towards the man who did not take them.

"Not quite. I'm a geologist and a petrologist. Some of the rare earths you use in this lab come from lodes I found. They are not always in the most accessible places."

"Well, that's fine." Dr. Thurmond's flat tone of voice did not reflect his words. "You have had plenty of experience taking care of yourself so you will be able to help Otto Thasler. He's the man in charge, the one who has to do the work, and you will assist him."

"Of course," Ben said and turned and walked away.

They were a clannish bunch and made no secret of the fact that he was an outsider. They would never have hired him if one of their own people could do the job. Transmatter Ltd. was richer than many governments, stronger than some as well. But they knew the value of the right man in the right job. A matter transmitter engineer for the trip was easy enough to find; just pick a suitable man from the staff and ask him to volunteer. Otto had had very little choice. But who would take care of him? In this overpopulated world of 1993 there were few frontiers left and even fewer men who knew their way around them. Ben had been in the Himalayas when the copter had come for him. His prospecting expedition was canceled, pressure from Transmatter, and a far better contract offered. He had been pressured into signing on, but that did not matter. Transmatter did not realize, and he had never told them, that he would have gone for one tenth the preposterous salary they offered—or even for free. These indoor types just could not realize that he *wanted* to make this trip.

There was a door nearby that opened onto a balcony and he went out to look over the city. He tamped tobacco into his pipe, but did not light it. There would be no smoking soon and he might as well begin to get used to it. The air was fairly fresh at this height, but the smog and haze closed in below. Mile after mile of buildings and streets stretched to the horizon, jammed, packed and turbulent with people. It could have been any city on Earth. They were all like this—or worse. He had come out through Calcutta and he still had nightmares about it.

"Mr. Duncan, come quickly, they are waiting for you."

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The technician shifted from one foot to the other and wrung his hands worriedly, holding the door open with his foot. Ben smiled at him, in no hurry, then handed over his pipe.

"Hold that until I get back, will you?"

The dressers had almost finished with Otto by the time Ben appeared and his own team rushed forward. They pulled off his coverall, then dressed him from the skin out in layer after layer of protective fabrics. Thermal underwear, a skintight silk cover over that, an electrically heated suit next, electric socks. It was done quickly. Dr. Thurmond came in while their outer suits were being closed and looked on approvingly.

"Leave the outer suit seals open until you get into the chamber," he said. "Let's go."

Like a mother hen with a parade of chicks, he led the way across the cluttered transmission room, between the banks of instruments and under the high bus bars. The technicians and engineers turned to watch when they passed and there was even one cheer that was quickly stifled when Dr. Thurmond looked coldly towards the man. Two dispatchers were waiting for them in the pressure chamber and they closed and sealed the door behind Dr. Thurmond and the two heavily garbed men. They were beginning to sweat. Dr. Thurmond pulled on a heavy coat as the cold air was pumped in.

"This is the final countdown," he said. "I'll repeat your instructions just one more time." Ben could have recited them equally well, but he remained silent. "We are now lowering the air temperature and pressure until it matches the Martian atmosphere. Readings just taken there show the temperature at twenty degrees below zero Fahrenheit and holding steady. Air pressure is ten millimeters of mercury. We are dropping to that pressure now. There is no measurable amount of oxygen in the air. Masks at all time, that is never to be forgotten. We are breathing almost pure oxygen in this chamber, but you will put on your masks before you leave . . ." He stopped and yawned and his ears popped, trying to equalize the pressure in his inner ear. "I will now go into the air lock."

He went and finished his lecture from there, watching them through the inset window. Ben ignored the drone of his voice and Otto seemed too paralyzed to listen. A thermostat closed in the battery case in the small of his back and Ben felt the heating elements grow warm inside his suit. The oxygen tank was slung onto his back and his face mask with built-in goggles was buckled into place. He automatically bit onto the oxygen tube and inhaled.

"Ready for the first man," Dr.

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Thurmond said, his voice squeaky and distant in the thin atmosphere.

For the first time Ben looked at the shining black disk of the matter transmitter set into the far wall. One of the dressers tossed a test cube into it as Ben lay face down on the table. While they were rolling the table forward the report came in. Everything in the green.

"Hold it," Ben said, and the table stopped. He turned to look at Otto Thasler who was sitting rigid, facing the opposite wall. Ben could imagine the terrified expression on the hidden face. "Relax, Otto, it's a piece of cake. I'll be waiting for you at the other end. Relax and enjoy it, man, we're making history."

There was no answer nor had he expected one. The quicker this part was over the better. They had been practicing the maneuver for weeks and he automatically took the position. Right arm straight forward ahead of him, left arm tight at his side. The matter transmitter screen grew like a great dark eye as the table rolled forward, until it was all he could see in front of him.

"Do it," he ordered, and they pushed smoothly against his feet.

Sliding. Hand, wrist, arm vanishing. Feeling nothing. A moment of recoil, of twisting pain, as his head went through, then he was looking at the coarse pebbles on the ground. He pushed aside the test cube and put his hand flat to break his fall. Then his other arm was through and his legs. Falling sideways in an easy roll his hip struck something hard.

Ben sat up, rubbing the sore spot and looked at the plastic container that he had landed on. Inside was a dying rat. A nice omen. He turned quickly away and went through the rest of the drill. The microphone was hanging in the same spot as on the mockup and he switched it on.

"Ben Duncan to Control. Arrived O.K. No problems." He should say more than that on this historical moment, but his brain was empty of inspiration. He looked around at the low dark hills, the crater nearby, the tiny bright sun. There was nothing that really could be said.

"Send Otto through. Over and out."

He stood, brushing some dust from his side, and looked at the shining plate. Minutes passed before the loudspeaker rasped, the voice so distorted he had to strain for the meaning.

"We read you. Stand by for transmission. Thasler coming through."

Otto's hand appeared even before the voice ended. It took the radio waves nearly four minutes to reach Mars, but the matter transmission was almost instantaneous since it went through Bhattacharya space where time, as it is normally constituted, does not exist. Otto's arm dropped limply and Ben took him by the shoulders, a deadweight

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that he eased to the ground. Rolling him over Ben saw that his eyes were closed. But he seemed to be breathing regularly. He was probably unconscious. Transmission shock they called it. It wasn't uncommon. He should come to in a few minutes. Ben dragged him to one side and went back to the radio.

"Otto is here. Out cold, but he looks O.K. Send the junk through."

Then he waited. The wind made a thin whistling noise as it blew against his mask and he felt the cold of it touching his cheeks. He did not mind: there was something almost reassuring that the wind could blow, the hard ground push against his feet, that the sun still shone. For all the evidence of his senses he could still be on Earth, perhaps on one of the high plateaus in Assam that he had so recently left. Consciously he knew that the sunshine here was half as strong as back on Earth. But he could remember cloudy, misty days with far less sun. Gravity? With all the equipment he was burdened with he was aware of no difference. Rounded, red hills in the distance, thin bluish clouds drifting across the sun. A remote corner of Earth, that's all it was. He could not grip the reality of Mars. If he had crossed space in a ship, taken weeks or months, he would have believed it. But a few minutes before he had been standing on Earth. He scuffed at the gravel with his boot and saw the second plastic tube that had been sent through with the struggling rat inside.

It was cold, freezing to death. It would scratch pathetically at the containing walls, then huddle up and shiver. And it had its mouth open, gasping. It appeared to have an even chance of running out of air or freezing first. Just a laboratory animal: thousands like it died every day in the cause of science. On Earth. But this one was here, perhaps the only other living thing on the planet. Ben knelt and twisted the lid off the tube.

The end was quicker than he had thought possible. The rat took one breath of the Martian air and gave a convulsive contraction of its entire body—and died. Ben had not thought it would be like that. Of course he had been told on Earth that the great danger of the Martian atmosphere was its complete dryness, containing only an unmeasurable trace of water vapor. They had said that inhaling it would scorch the mucous membranes in the nose, throat and lungs so fiercely that it would be the same as breathing concentrated sulphuric acid. This had seemed a little preposterous. Then. The rat's staring dark eye filmed as it froze. Ben straightened up and pushed his face mask tighter against his face. He checked Otto to make sure his was correctly in place, too.

No, this was not Earth. He could believe it now.

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"Attention! Please," the loudspeaker chattered. "Will you be able to handle equipment yourself? Is Thasler still unconscious? Loads were estimated for two-man manipulation. Report."

Ben grabbed the microphone.

"Send that stuff through! By the time you get this message twelve minutes will have been shot. Send it! If anything gets broken, you can send replacements. We're alone here, can you understand that, with just the oxygen we have and nothing else, stuck at the other end of a one-way door a couple of hundred million miles from Earth. Send everything—*now! Send it!*"

Ben paced up and down, hammering his fist into his palm, kicking the test blocks and the rat sarcophogus to one side. The fools! He looked at Otto who seemed to be enjoying his rest. A wonderful beginning. He dragged Otto to one side where he wouldn't get stepped on and came back to the screen as the end of a canister emerged.

"And about time!"

Grabbing the end he ran forward until the other end appeared and clanged to the ground. OXYGEN—FOOD the painted letters on it read. Fine. He kicked it rolling to one side and jumped for the next one.

The demand regulator on his back was clicking regularly, feeding him an almost steady flow of pure oxygen, and his head was swimming with fatigue. The ground all about was littered with containers, tubes and bundles of all lengths, but with the same diameter. Otto tapped him on the shoulder and he dropped the case he was dragging.

"I passed out, I'm sorry. Is anything—"

"Shut up and grab that tube that is jamming up in front of the screen."

One, two more, then Ben looked on and blinked as a shining dural plate fell from the screen and clattered to the ground. He bent over and saw that someone had lettered on it with red grease pencil.

"SUGGEST YOU CHECK OXYGEN TANK LEVEL. ERECT SHELTER. CHANGE TANKS."

"Someone is thinking now," Ben muttered and jerked his thumb at the tank on his back. "What does it read?"

"Just a quarter left."

"They're right. Erecting the shelter gets priority."

Otto rooted about among the canisters while Ben stretched out the long and unwieldy fabric sausage. The fastenings snapped open easily and he spread it out flat just as he had done in training. Only during training he had not hovered on the edge of exhaustion, fighting the heavy shelter material with clumsy gloves. It was finally done and he looked up to see Otto fastening a tank to an inlet tube with the quick fastening attachment.

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"What the hell do you think you are doing?" Ben said, the words rasping in his dry throat. He hit Otto on the shoulder knocking him sprawling.

Otto just lay there, wide-eyed and silent, as though he thought Ben had gone mad. Shaking with anger Ben pointed to the connection.

"Use your eyes. Stay alert. Or you will kill us both. You were attaching a green tank to a red pipe."

"I'm sorry— I didn't notice—"

"Of course you didn't, you stupid slob. But you *have* to here. Red is oxygen, what we breathe and what inflates the shelter. Green is the insulating gas that goes into the double wall. Not poisonous, but just as deadly because we can't breathe it."

Ben made the connections himself and would not let Otto come near, even threatening him with the wrench when he tried to. One tank of oxygen blew the shelter up to a pudding-shaped mound. The second erected it to a firm dome and the pressure valve on the inlet sealed shut automatically. Ben knew that he was almost out of oxygen, but he could not stop before he finished this. He attached the green tank and left it alone to fill the insulating layer by itself. Now the heater. He was dragging it towards the air lock on the shelter. Letting go he staggered one step, two, then dropped unconscious.

"Have more soup?" Otto asked.

"A good idea." He sipped the cup empty and passed it over. "I'm sorry about the names I called you. Particularly since you managed to save my life right afterwards." Otto looked uncomfortable and bent over the pressure stove.

"That's all right, Ben. I deserved what you called me and more. I must have panicked. I'm not used to this kind of thing the way you are."

"I've never been to Mars before!"

"You know what I mean. You've been everywhere else. I've been to college, and to the job, and holidays in the Bahamas. I'm a city boy, a real urban dweller."

"You did fine when I blacked out."

"Without you there to back me up I suppose I had to. Your tank was empty and I was sure it was anoxia. I knew the shelter had oxygen in it so I just dragged you in here as quick as I could. I pulled off your mask and you seemed to be breathing O.K., but it was cold so I went after the heater, then the food. That was all. I just did what had to be done." His words trickled off into silence and he looked owllike and frightened again behind his heavy-rimmed glasses.

"But that is all that *had* to be done. All that can be done." Ben leaned forward, hammering the words home. "No one could have done more. It is about time you

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stopped thinking of yourself as one more city boy and faced the fact that you are one of the only two Martian explorers in the whole solar system."

Otto thought about it and almost straightened up his shoulders. "That is true, isn't it?"

"Don't you forget it. The worst is over. We are safely through that box of tricks, which is always what troubled me, and we are at home on Mars. We have food, water, everything we need for months. All we have to do is take normal precautions, do your job, and then go back as heroes. Rich ones."

"We have to set up the transmitter first, but that should not be difficult."

"I'll take your word for it, thanks." Ben took the soup and sipped at it noisily because it was hot. "I have no idea why we even have to build another MT when we have one here. In fact I don't even know how the thing works and no one ever bothered to tell me."

"It's simple enough." Otto relaxed, on familiar ground, eager to explain, forgetting their situation for the moment. Which is just why Ben, who knew a good deal about MT theory, had asked him the question.

"The discovery of Bhattacharya space is what made matter transmission possible. Bhattacharya space—or B-space—is analogous to our three-dimensional continuum but nevertheless lies outside of it. But we can penetrate it. The interesting thing is that wherever we penetrate it, from whatever location in our own universe, we appear to come through in the same place there. So by careful alignment it is possible to have two screens sharing the same portion of B-space. The B-space, in effect, is allowed to penetrate into our space before each screen so that as far as we are concerned the screens no longer exist in our space-time continuum. Whatever enters one comes out of the other. That is it."

"Simple enough—as long as you leave out the details about how the gadget is built. But it doesn't explain why we can't leave Mars in the same manner that we came."

"There are a number of factors involved, but the more important ones are alignment power and physical distance."

"You told me distance doesn't affect the screens?"

"It doesn't, directly, but it makes alignment much more difficult. The screen out there that was rocketed here to Mars has a two-foot working diameter, about the very largest we could send. Almost all of its power goes to holding its existence. The transmitter on Earth reaches out and . . . it is difficult to describe . . . latches onto it. Holds it in shape, stabilizes it to receive transmission. But the same process won't happen in reverse."

"What would happen if some-

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thing were sent back in the other direction?"

"There is no 'other direction'. Anything put into this transmitter would be converted to Y radiation and simply sprayed into Bhattacharya space."

"Doesn't sound healthy at all. What do you say we recharge our oxygen tanks and move the rest of the stuff in here that we are going to need? Then get some sleep."

"I'm with you."

They gathered only the immediate essentials, food, air-scrubbing equipment and the like, then crawled into their sleeping bags. The next day they were both feeling much better and finished setting up the camp. On the third day the first pieces of the big matter transmitter were sent through.

It was a component engineer's nightmare. All the units, whatever their function, had to have been designed to fit through a two-foot hole. A number of compromises had been made. After a good many sleepless nights over the drawing boards it had been finally decided that a diesel-electric generator could not be modified enough to get it through. Some nameless sub-engineer bestowed credit on his superiors by suggesting that enough high-charge batteries could be sent through to activate the big six-foot screen long enough to push the generator through in one piece.

The supporting frame had been set up and they had adapted a routine. Ben, who was in far better shape for the physical work, was doing most of the construction work, while Otto worked in the shelter assembling the electronic components. They helped each other when they had to. Ben finally tightened the last bolt on the steel frame, kicked it affectionately, and cycled through the air lock into the shelter. In the morning they could wire-in the screen-face elements.

Otto was slumped over the workbench, his face flattened against a printed circuit module, his skin red and flushed. His hand was resting on the hot soldering iron and the air stank with the smell of burnt flesh.

Ben dragged him over to his bunk, feeling the burning heat of his flesh all the while. "Otto," he said, shaking him, but the man was limp. His breathing was heavy and slow and he would not regain consciousness. Ben made a thorough job of bandaging the severely burnt hand and tried to order his thoughts. He was no doctor, but he had enough field training with medicine to be able to identify most severe diseases and traumatic injuries. This fitted no categories. His mind sheered away from any thoughts of what it really might be. He finally gave Otto a heavy shot of penicillin and made notes of the man's temperature, respiration and pulse. Sealing his suit he went to the capsule and called Earth.

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"I want this transcribed. I am going to give you some information. Do not answer until I am finished and when I am done do not radio but type copy and send it through the MT. All right. Otto is hurt, sick, something, I'm not sure. These are the details."

He sent what he had observed and what he had done, then waited the slow minutes until his message was received and the answer had arrived. As he finished reading it he crumpled the paper in anger and grabbed the mike.

"Yes, I have considered the possibility of a Martian disease and no, I will not research and send reports. Get a doctor through at once. Offer enough and you'll get a volunteer. Start sending his equipment now while you are finding and dressing him. *Then* you can send through your microscope and sampling equipment and I will be glad to look for microorganisms in the dirt or wherever you want. As we reported, we found some small plantlike growths, but we didn't bother them. The biologists can look into that. I'll look for your germs for you, but only after you have done what I tell you."

His message was understood. Transmatter Ltd. were just as eager as he was to insure the safety of the expedition; they had a lot of money tied up in it, and were not at all hesitant to risk some more lives in the effort. The doctor, a bewildered, young, staff medic—who had just signed papers that made his wife financially independent for life—dropped to the ground less than half an hour after the last of his equipment and supplies had arrived. Ben hurried him into the shelter and peeled off his outer clothing.

"I've set up all your stuff on the bench there. Your patient is waiting."

"My name is Joe Parker," the doctor said, but he lowered his extended hand when he saw the look on Ben's face. He hurried over to the sick man. Even after a complete examination he was reluctant to admit the truth.

"It could be an unusual disease—"

"Don't dodge the point. Have you ever seen anything like it before?"

"No, but—"

"That's what I thought."

Ben sat down heavily and poured himself a waterglass of the medicinal brandy, then hesitated and poured a smaller one for the doctor.

"A new disease, something really new? A Martian disease?"

"Probably. That's what it looks like. I'll do everything in my power, Ben, but I have no idea how it will turn out."

They both already knew, although they would not admit it out loud. In spite of all the medicines and supportive treatment Otto died

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two days later. Parker made a postmortem examination and discovered that most of the victim's brain had been destroyed by an unknown organism. He froze samples and made numerous slides while Ben worked on the large transmitter.

Word about what had happened must have circulated among the staff on Earth because it took four more days to get an engineer volunteer to finish the technical end of the MT. He was a frightened, silent man named Mart Kennedy and Ben did not talk to him about it because he did not really want to know what pressures had been used.

The work went quickly then, even though a dark shadow seemed to hang over their lives. They ate together without much conversation and pushed the construction. Dr. Parker had been working hard and thought that he had obtained a transparent liquid that contained the submicroscopic agent responsible for the disease. This was tightly stoppered and sealed in a case for transmission as soon as the screen was operating.

On the morning of the day operating tests were to begin, Mart Kennedy rose early to watch the sunrise. He had barely been aware of his surroundings since he had arrived, working with almost no rest on the big screen. That was all right, too; thinking about the Martian crud was avoided that way. It was a misapplied, supposedly funny, name that did not conceal the waiting horror. Certain death. Mars, it certainly was something. In his most wayout dreams, reading space fiction as a kid, he had never thought he would ever be here. He yawned and went to put the coffee on, then woke the others. Ben's eyes opened instantly and he nodded, fully awake. Parker wouldn't stir and he shook him by the shoulder—then jerked his hand away in sudden fear.

"Ben," he called out, stammering over the sounds as he did when disturbed. "S-something's wrong here."

"The same, the symptoms are all the same," Ben said, hitting his fists again and again against the head of the bed without realizing it. "He has it all right. We'll give him the shots and get the screen working. There's nothing else we can do."

The big matter transmitter had been ready to go the day before, but they had all been too tired to finish the job. Ben made the sick man as comfortable as he could, giving him the medication that had not worked before, then joined Mart Kennedy.

"Everything tests in the green," Mart said. "Ready to activate whenever you say."

"That is right now. The sooner the better."

"Right."

The screen flickered and darkened, then went black all over. Ben

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had scrawled SEND GENERATOR on a canister lid and he threw it into the screen. It vanished. To Earth—or into radiation in B-space. Nothing happened. Seconds trickled by. The batteries could only hold the screen for about a minute.

Then it appeared. The leading edge of the wheeled platform dropped to the ground and they pulled hard on the handles. The heavy motor-generator came through and they rolled it aside. Behind them the screen wavered and the field died.

"Hook up the leads while I fire it up," Ben said.

He cracked open the valves on the fuel and oxygen tanks and pressed the starter. It kicked over with the first turn. Prewarmed before it had been sent. As the power built up the transmitter screen was restored. A container with a frightened rat came through and they returned it at once. There were more tests, more rats, and Ben sent a message through with them about Dr. Parker. The answer came quickly enough.

"WE ARE PULLING YOU ALL OUT," the typed message read. "EQUIPMENT IS TO BE LOCKED ON AUTOMATIC AND WE WILL OPERATE FROM THIS END. THANK YOU FOR YOUR AID. TRANSMISSION WILL BEGIN. SEND DR. PARKER THROUGH FIRST."

Ben scrawled a quick note and sent it.

"WHAT WILL HAPPEN TO US?"

"A SEALED QUARANTINE UNIT HAS BEEN ESTABLISHED WITH ENTRANCE ONLY BY MT. YOU WILL BE CARED FOR. EVERYTHING POSSIBLE WILL BE DONE."

"Let's get Parker," Ben said after he had read the note.

They dressed the unconscious man, and Ben made sure that the oxygen tube could not slip out of his mouth. A stretcher had been sent through earlier and they rolled him onto it and strapped him into place.

"Take the front," Ben said and they started towards the air lock. It was cramped, even with the stretcher standing on end, but they got through. Ben took up his end of the stretcher without a word, without even looking back, and they went to the large transmitter. It was big enough for the three to go through together.

The light was stronger than they were used to, and Ben's legs felt heavier. When he opened his face mask the air was thick and had unusual smells in it. They stood in a bare hallway with a transparent wall. At least a hundred men were watching them from the other side.

"Dr. Thurmond speaking, here are your instructions," a loudspeaker said. "You will—"

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"Can you hear me?" Ben broke in.

"Yes. You will wait until—"

"Shut up and listen closely. You now have two specimens, a sick man and a well one. That's enough. I'm going back to Mars. If I have to die, I might as well die there." He turned to the plate but Dr. Thurmond's voice stopped him.

"You cannot. It is forbidden. The screen is turned off. You will do as ordered."

"No, I won't," Ben said loudly, and even smiled a little. "I have taken my last order. Those weeks on Mars helped me understand a little about my life on Earth. I don't like people in crowds, in large stinking depressing numbers, eating and reproducing and polluting this Earth. It was a fine place before the people spoiled it. I'm going back to the world they haven't spoiled. Yet. With some luck perhaps they never will. I remember a dead rat, he came with me to Mars. A laboratory specimen. And that is all I am now in your eyes and I won't have it. I would far rather be the first Martian."

The crowd parted as Dr. Thurmond came forward and stood looking through the transparent wall at Ben, just inches away. He was angry, but he controlled it. He raised the wireless microphone and spoke.

"That is all very nice, but it does not bear on the case in hand. You are an employee and bound by contract and you will do as you are ordered. Your room is number three and you will go—"

"I will go back to Mars." Ben

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in times to come *In addition to Part II of "The Siren Stars" the upcoming issue will have a feature novel—with cover by Freas, and a good one!—titled "Here There Be Witches." It's by Everett B. Cole, an author we haven't heard from in more than a decade. Cole's retired now; the past decade it seems the Army kept him a bit too busy. But his Philosophical Corps is back in action with a very neat series of ploys demonstrating how to make a bunch of witch-hunters wish they hadn't.*

Imagine the dismay of an Inquistionist who got hold of a real *witch, possessed of* real *supernatural powers—say the "supernatural" powers of a highly advanced technology.*

After all the accused witch is supposed to be the victim—not the smug and greedy witch-hunter!

Also—if we can fit it into your type-metal jigsaw known as the April issue —a little puzzle story titled "Come You Nigh: Kay Shuns," by Lawrence A. Perkins. It's about a coded message. No computer could crack it—but you can, with a little ingenuity, read it right off! And then you can try making up your own computer-proof coded messages. ■ THE EDITOR

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slipped the chrome steel pinch bar out of his pocket and tapped it against the window. Some of the men shrank back, but Dr. Thurmond did not move.

"This is a tool," Ben told them. "I will use it. I will find a door, or a crack, or a window gasket and I will lever away until I get through to your side. And then all the nice Martian crud germs will come out and eat you. So it is really you, Dr. Thurmond, who has no choice. Or rather a choice of two possibilities. You can kill me, or send me back to Mars. Now make up your mind."

Dr. Thurmond's face was drawn with hatred though his voice was calm as ever.

"I won't mention loyalty to you, Duncan, because you have none. But I will tell you that too much money has been spent to jeopardize things now. You will do as ordered."

"I will *not*!" Ben said, and swung the pinch bar so hard that a chip flew from the plastic surface. This time even Dr. Thurmond winced away.

"Can't you understand that I don't like it here and I am not staying here? And that just for once you have found someone whom you cannot order about? I'll be of immense value on Mars if the crud doesn't knock me over. Use that to convince yourself. But do it quick."

Another chip cracked off the window as he hit it. Dr. Thurmond did not speak but stood rigid. It wasn't until a third chip dropped to the floor that he turned his back suddenly.

"Activate the transmitter," he ordered, then turned off the microphone. The screen went dark. Ben looked at the shimmering surface, then back at the observers.

"Don't make any mistakes, Dr. Thurmond," Ben said. "I know you can have that screen out of sync and can send me through into B-space as a spurt of radiation. And that is that. But I sincerely hope that you are not going to be that wasteful. I won't ask you for any sympathy, since I know it would please you immensely to kill me in that fashion. But I must remind you that others have heard this talk we have had and you must have superiors who will resent the loss of a valuable man like myself, manager-to-be of your Martian settlement. Why I'll bet they could fire you just as fast as you fire your underlings."

Ben started towards the screen then looked back to face the still silent audience.

"I'll do a good job of running things on Mars. If I live, I'll keep on doing the work, so you lose nothing by it. But, if I don't do it, I imagine you'll find other applicants for the job pretty hard to come by."

Without waiting for an answer he sealed his face mask and stepped into the screen. ■

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ROVER DOES TRICKS IN SPACE

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ROVER DOES TRICKS IN SPACE

Chemical rockets did the job of getting men to the Moon and home again—but we're going to need something better for manned flight to Mars, or beyond!

WALTER B. HENDRICKSON, JR.

Rover is a joint program, for the development of a nuclear rocket, being conducted by the National Aeronautics and Space Administration (NASA) and the Atomic Energy Commission (AEC). One of Rover's first "tricks" will be to provide a jump in performance like that given by the use of liquid oxygen and hydrogen in the upper stage of the Centaur and Saturn. This jump was forecast in 1967 by Dr. Mac. C. Adams, NASA's Associate Administrator for Advanced Research and Technology.

The nuclear rocket will use about half as much propellant to lift the same amount of weight. This is because a nuclear rocket does not depend on the combustion of fuel in an oxidizer to provide its thrust as do the chemically fueled rockets now in use. Instead it relies on the heat generated by a nuclear reaction to send a hot stream of propellants jetting out its exhaust nozzle.

Since it is the velocity of the escaping exhaust gas that drives a rocket forward this must be increased in order to improve the rocket's performance. This can be done either by raising the temperature of the exhaust or cutting the molecular weight of the propellant. Chemically fueled rockets already operate at 2,727°C.—a few degrees hotter than the 2,227°C. operating temperature of NERVA (Nuclear Engine Rocket Vehicle Application) engine.

So lighter propellants are needed to improve the exhaust velocity. The liquid hydrogen—liquid oxygen powered engines of the Centaur and Saturn upper stages are already as light as any possible chemical rockets with a molecular weight of 18. Nuclear rockets, however, can use any propellant that is not too difficult to handle and that won't react with the nuclear core.

The best choice would seem to be the lightest of all elements, atomic hydrogen (weight 1). However, a heat great enough to disassociate—separate into atoms—molecular hydrogen could cause the graphite core of the reactor to sublimate, change directly to vapor

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without first melting. In the end you would have nothing but a hydrocarbon, CH4, that is methane.

As a matter of fact, the NERVA already operates within 802°C. of the sublimation point of graphite which is 3,627°C. Still there is no danger of the graphite becoming soft or brittle because of an unusual characteristic of this substance. Its strength actually increases as the temperature rises up to about 3,029°C. Because of this unusual property graphite has been used in rockets before. It served in the rudder-like jet vanes used to steer the V-2 rocket by deflecting its exhaust.

Fortunately molecular hydrogen, with two atoms to the molecule, is a great improvement over chemical rockets. When the Rover program began in 1950 not much was known about handling liquid hydrogen. So other propellants also were considered.

William R. Corliss of the AEC explains, "In the early days of nuclear rocketry . . . ammonia and methane were competitors of hydrogen because hydrogen was feared as a fickle, explosion-prone material that had to be stored as a liquid at temperatures of only 20°K (−253°C.)"

Methane and ammonia are almost as good as hydrogen because their molecules disassociate at temperatures around 2,727°C. This cuts their molecular weight down from 16 to 3.2. However, the techniques of handling large quantities of liquid hydrogen were mastered in the development of the Centaur and Saturn upper stages. So the nuclear rocket was able to capitalize on this knowledge.

Of course, other techniques developed for use in chemically fueled rockets, some of them hundreds of years old, have been used in the NERVA. This accounts for the circuitous route that the liquid hydrogen must follow on its way to the reactor.

The NERVA uses a self-starting method known as "boot strapping." The hydrogen in the NERVA's propellant tanks pressurizes itself as it vaporizes. Under this pressure a small amount of hydrogen is fed through a turbine which spins a centrifugal pump sending more hydrogen on its way to the reactor. Once the hydrogen has begun to flow through the reactor about three percent of the hot hydrogen is drawn off to push the turbopump up to full power. After passing through the turbine, the hydrogen is exhausted through nozzles on each side of the rocket. In flight these nozzles could be used to aid

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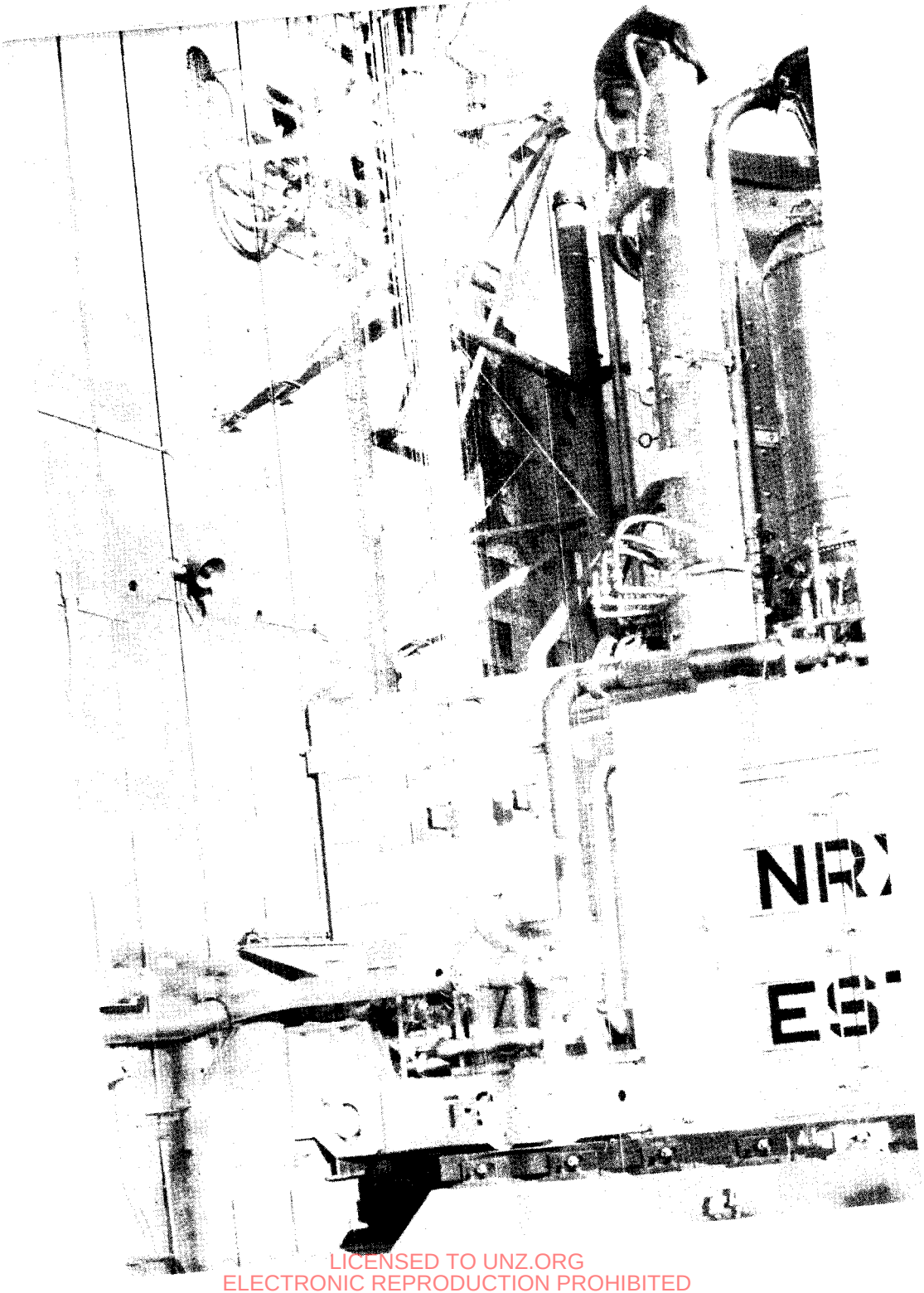

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The NRX/EST (NERVA Reactor Experimental/Engine System Test)was tested in February and March 1966, at the Nuclear Rocket Development Station by Aerojet-General Corporation, and Westinghouse Astronuclear Laboratory.*

In this engine system test of a "breadboard" engine, all the components of a complete engine were operated together for the first time and it established many engine system concepts.

NASA

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in attitude control and for thrust augmentation. This method of putting the turbine exhaust to work was first used on the early high-altitude rockets shortly after World War II.

Since part of the hot hydrogen exhaust of the NERVA is drawn, "bled," off to bring the pump up to full power this system is known as the "hot bleed cycle." Actually, it was chosen as the best of three possible cycles for driving the turbine. The other two candidates for the honors of powering the NERVA's turbine were the "cold bleed cycle" and the "topping cycle."

In the cold bleed system hydrogen is taken from the plenum at the top of the reactor to drive the turbine. Although this hydrogen is quite hot it is still very cold in comparison to the rocket's exhaust. Being "cooler" it has less energy to drive the turbine. So in the cold bleed cycle some twenty percent of the hydrogen must be diverted to run the turbine. As William R. Corliss explains, "This inefficient use of hydrogen reduces overall rocket performance."

The topping cycle is similar but in this case all of the hydrogen is passed through the pump and then through the reactor. This has the advantage that none of the hydrogen is jettisoned after passing through the turbine. So a rocket using this system would have the highest velocity of all. However, the turbine of such a NERVA would have to gulp down hydrogen at the rate of eight tons per minute. This would make it an unwieldy monster too heavy for the rocket to handle.

In the chosen hot bleed cycle, on its way to the engine the hydrogen is first pumped through tightly coiled tubing around the rocket's stainless steel nozzle. This is a method used by all liquid fueled rockets, since Dr. Goddard's time, to keep the exhaust nozzle from melting under the great heat of the rocket's exhaust.

The fuel is pumped into the engine at a rate of 8 tons per minute at a pressure of 94 atmospheres (1,300 pounds per square inch). It flows through numerous holes in the graphite encased Uranium-235 reactor. These holes must be exactly the right size. If they are too large, the engine will be too bulky for a rocket; and, if they are too small, there will be too much friction on the hydrogen flow.

The NERVA reactor is controlled by rods with neutron-absorbing boron on one side. When the boron is turned in it keeps the neutrons from being reflected back into the reactor to continue the chain reaction by knocking loose more neutrons.

The speed of the NERVA rocket

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can be increased simply by diverting more hydrogen through the turbine. This causes more hydrogen to be pumped into the reactor. The hydrogen, in turn, boosts the power of the reactor by slowing the neutrons down so that they can create fission more easily.

As the reactor power increases its temperature also rises. The heat causes the hydrogen to expand so that there is actually less in the reactor although the propellant is flowing through faster. This causes the reaction and the temperature to drop back to its original value. The hydrogen flow rate, however, has been increased causing added thrust.

Similarly, when the amount of hydrogen flowing through the reactor is decreased so is its power. When the hydrogen flow is completely cut off the reactor is practically shut down also. The control rods also can be rotated into position to absorb any stray neutrons that may still cause chain reactions.

As the hot hydrogen boils out of the reactor it squeezes through the throat of the rocket's nozzle which forces the exhaust to an even higher speed. So it spews out of the flaring cone of the nozzle at the speed of sound.

This divergent section of the nozzle must be as large as possible in comparison to the throat to provide a wide area for the exhaust gases to push back against. For boosters the ratio is about fifteen to one. In space, where the NERVA would be operating, it can be as high as one hundred to one. The only limit is the length and weight of the nozzle. Incidentally, this nozzle is the oldest design in the NERVA. The basic idea of the convergent-divergent nozzle has been traced back to the Chinese who, of course, invented the rocket about one thousand years ago.

The complete nuclear rocket engine weighs fifteen tons. Yet the flight model of the NERVA will be mounted on gimbals so that it can be turned to steer the rocket just as the much lighter chemically fueled engines are.

The first test model of the Rover series was the Kiwi. This nuclear bird, flightless like its New Zealand namesake, developed the basic concept for nuclear rockets. To simplify things the Kiwi reactors were fired with their nozzle's point upward. Also for simplicity the first series of Kiwis, the Kiwi-A, used pressurized hydrogen gas instead of liquid hydrogen.

The Kiwi-A test firings started in July 1959 with a five-minute run which generated seventy megawatts of power and a temperature of 1,504°C. The test showed some erosion of the graphite by the hot hydrogen. This problem was solved

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by coating the graphite with niobium carbide on the next two tests, in 1959 and 1960.

The next step in the nuclear rocket development was the Kiwi-B. Designed to be ten times as powerful as the first Kiwis, it would run at about 2,126°C. and develop 1,100 megawatts of power. With this step the Rover project had already produced its first significant rocket. If the Kiwi-B could have been used in space, it would have developed 55,000 pounds of thrust.

The Kiwi-B tests began with gaseous hydrogen being used on the first trials in December 1961. Then the next two, September 1962 and November 30, 1962, were run with liquid hydrogen. Trouble arose when excessive vibrations caused the graphite core to crack. The firings were discontinued while scientists worked carefully for eighteen months to develop a vibration resistant reactor.

The success of their endeavors was proved when testing was resumed in May 1964. "Since then," William R. Corliss says, "a long series of highly successful tests have proved the redesigned nuclear core to be sound."

There have, of course, been a few failures, but these have been the result of mechanical problems not errors in the basic design of the reactor. In fact, the Rover program had produced a remarkably good record for the development of a new rocket engine.

The next step after the Kiwi was the Phoebus reactor, an improved and more powerful version of the Kiwi. One addition was the divergent cone of the nozzle which had been left off of the Kiwi models. The first test firing of the Phoebus reactor was in February 1967. Phoebus has contributed much valuable information to the NERVA rocket—the final step in Project Rover.

NERVA is the prototype of the flight model nuclear rocket. The first NERVA test models produced only 5,000 pounds of thrust, but later versions produced the full 200,000 pound thrust of the flight model. This is small in comparison to the engines of many of the giant space boosters. However, it is equal to many of the engines used in space. This is perfectly satisfactory since nuclear rockets must be restricted to use in outer space because of their high radiation levels.

While it may seem small alongside chemically fueled boosters, the NERVA is pretty hefty in comparison to other nuclear reactors. It can operate successfully at 2,227°C. and develop more than five thousand megawatts of thermal power. This is twice the power and three times the heat of a commercial nu-

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clear electric generating plant. The NERVA, however, has to run less than an hour. Similarly, chemically fueled rockets can develop much greater power than conventional electric power plants for short bursts.

By May 1967 eight tests of the NERVA had been completed, in a series that began in 1964. Nearly five hours of firing was accumulated during these tests. The last three tests, begun in the spring of 1966, lasted for thirty minutes each at full power—the longest time a nuclear rocket is expected to run in actual flight.

The first series of NERVA tests used a "breadboard" model engine —one having all the parts needed for a flight model but not in flight configuration. Also the rocket nozzle was pointed upward while on an actual flight the nozzle would be pointed down. A special firing platform, Test Stand 1, was completed in 1967 so that the flight models could be fired with the nozzles pointed downward. The first of these test firings was made late in March 1969.

Although nuclear rockets are heavier and more expensive than chemically fueled rockets of the same size, this is off-set by the fact that they use only half as much fuel. With a nuclear upper stage the Saturn V could carry 30 to 300 percent heavier spacecraft—depending on the mission. For this reason the Saturn V was originally designed with the possibility of a nuclear upper stage in mind. The flight model of the NERVA is thirty-three feet wide so that it will fit this role.

A building for the preparation of nuclear upper stages was included in the plans for the Saturn V complex on Merritt Island. All that would be needed is some shielding at the reactor levels of the Vehicle Assembly Building and service tower. Of course shielding would also be provided for the spacecraft and eventually the crew.

Providing this shielding for the spacecraft and crew poses a problem, however. Using heavy lead or cement shielding would greatly reduce the added payload expected to be gained by using a nuclear rocket. The best method of "shielding" is to put the crew at a safe distance, about 1,000 feet, from the radioactive core of the reactor.

The fuel tank of a NERVA takes up only about one tenth of this distance. A long boom would have to provide the rest. Obviously, such a long spacecraft would be too ungainly for launching into orbit. In space, however, such a long, spindly spacecraft would not be particularly unusual. In fact, it might be an advantage since the craft could be rotated slowly to provide artificial gravity.

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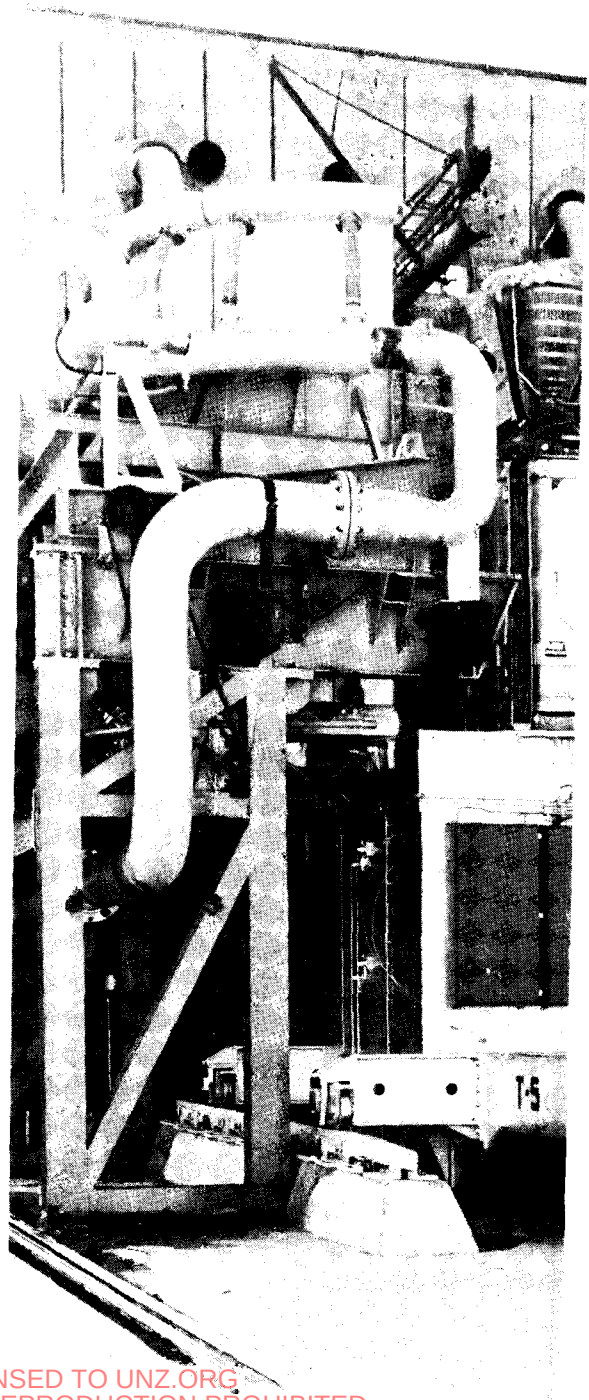

Phoebus 1B, an advanced nuclear rocket reactor, was tested on February 23, 1967, at the Nuclear Rocket Development Station. The Phoebus 1B was tested for 30 minutes at power-density levels approaching the power-density levels for high-thrust flight systems.
The test was a part of the continuing Rover Program—the nation's program to develop the technology of nuclear powered rockets capable of extensive space exploration. The Rover Program is directed by the joint AEC-National Aeronautics and Space Administration's Space Nuclear Propulsion Office.

NASA

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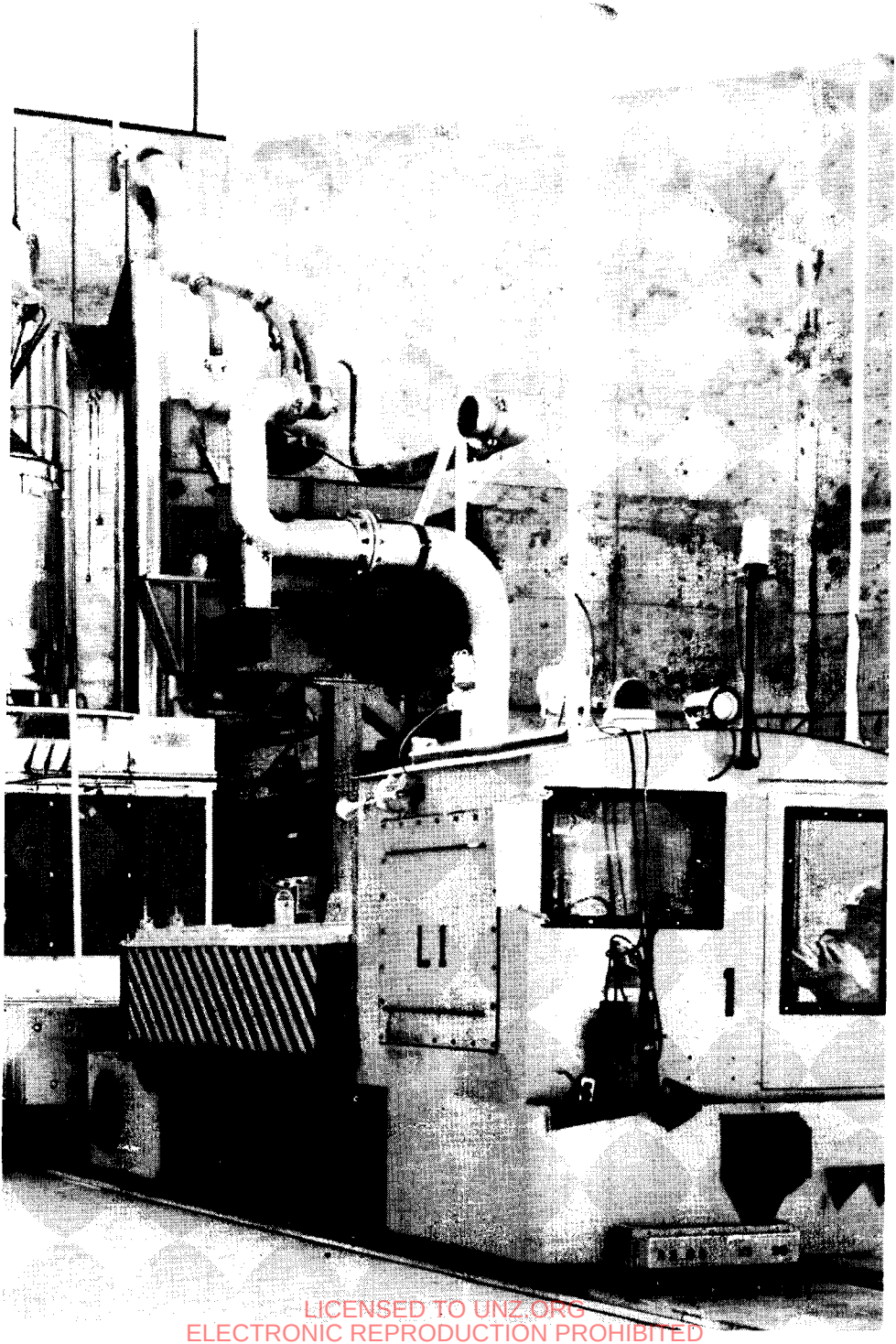

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To create such a spacecraft in orbit the NERVA reactor would be launched first—unmanned. Then the long boom would either be extended from the spacecraft or constructed from a series of modules docked to the reactor. Finally, the crew would be ferried up to the spacecraft by chemically fueled rockets.

Special tests using small scale dummy models of the NERVA have shown that there is little danger of harmful radiation being released if the booster rocket is blown up in flight. Also the almost flawless record of the Saturn V thus far has shown that there is very little danger of this occurring. As for an explosion on the launch pad, this has not happened at Cape Kennedy since the Centaur launching on May 2, 1965.

As yet no specific mission has been assigned to the NERVA. However, the development of a rocket engine requires a longer time than the mission preparation; just as one million pound rocket engines were being developed long before the Saturn V itself took shape.

The general range of missions for the NERVA was outlined by William R. Corliss of the AEC: "The role of the nuclear rocket is not in journeys beginning at the launch pad, for which chemical engines have been so successful, but rather in outer space where the nuclear rocket's high exhaust velocity is a great asset. We should think of nuclear rockets then, as prime movers beginning *from an earth orbit* and moving outward toward the moon and planets."

Several possible missions of NERVA are included in this range. First there is the probe to the outer planets, Jupiter, Saturn and beyond. A similar probe could be sent sunward for a close look at the planet Mercury. On these missions the nuclear rocket would allow the Saturn V to carry 70 to 100 percent heavier spacecraft.

On the outer planet probe it also could cut the trip time to two or three years—less than half the time required by chemically fueled rockets. This will be a great advantage since most of the trip time is spent on the way to the planets.

A second reactor might also be carried by this probe to power the spacecraft's electrical system out where the sun's light is too faint to produce electrical power from solar cells.

The most glamorous mission for the NERVA would be a manned mission to Mars or Venus—or both if the timing were just right. On this mission the NERVA would allow a 100 to 300 percent increase in the size of the manned spacecraft. A single NERVA en-

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gine would be enough for a manned fly-by of Mars or Venus.

For a manned landing five NERVA engines would have to be joined together in space. A fifth rocket with a chemical engine would carry the astronauts to the surface of the planet thus avoiding any radioactive contamination of the planet. Even with one chemically fueled module the spacecraft would be much smaller than an all chemically fueled rocket for the same mission. This, in turn, would mean fewer sections to be assembled in earth orbit. This would reduce both the cost and the possibility of failures.

A more prosaic use for the NERVA would be on a ferry-rocket plying between an orbit around the earth and an orbit around the moon. On this mission it would inrcease the payload of the Saturn V thirty to sixty percent.

Chemically fueled rockets would take passengers from the nuclear powered ferry to the surface of the moon or earth. The only time the NERVA rocket would land on the moon or a planet —at least in the early stages of space travel—would be when it was to be converted into a power station for a permanent base. Of course, to do this some way would have to be found to tame the NERVA to the production of steady power instead of brief spurts.

Astronomers conducting cosmic ray and other radiation studies in space would probably oppose a nuclear lunar ferry. Such a craft would be even worse than a jet airliner taking off in front of an optical telescope. Also the nuclear ferry would be plying cislunar space on a regular schedule and contributing little scientific information as a trade-off for disrupting space radiation studies.

On the other hand a large, nuclear powered interplanetary flight would obviously have a great deal of valuable scientific information to contribute. Besides it would only be orbiting earth for a few weeks before heading out to the planets.

When the nuclear rocket returned to earth, however, disposing of the spent nuclear engine would be a hot problem—radioactively that is. The nuclear rocket could not be allowed to plummet into earth's atmosphere as an Apollo service module does. This would clearly create a large amount of fallout, and possibly even a few radioactive meteorites might reach earth. Not only would this be dangerous, it might be considered a violation of the nuclear test ban treaty.

If the rocket were left in a high orbit it would be interfering with astonomers' radiation studies for

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centuries and contributing absolutely nothing in return.

The best solution, at least for early flights, would seem to be to send the spent NERVA off into solar orbit as is now done with used Saturn S4B stages. Some care should be taken to see that the used nuclear rocket didn't show up again like a bad penny.

Throwing away nuclear rockets, however, would hardly be economical for regular interplanetary flights. In this type of service the interplanetary rocket would be spending several months near earth waiting for the next window for a flight to the planets.

It would probably be best for the ships to spend this layover on the moon. There the reactor could be moved into a radiation shielded bunker, out of the astronomers' way, while it was being serviced. This would mean involving the moon in our pollution problems, but at least they could be restricted to one area, probably a medium-sized crater. The need for extra fuel to take off and land on the moon could be offset by manufacturing the hydrogen from rocks on the moon.

Of course, the NERVA is only the beginning for nuclear rockets. The next step would be a gaseous core reactor capable of operating at a heat hot enough to disassociate molecular hydrogen into atomic hydrogen. This would again double the power of the rocket creating the same advantages over the NERVA as the NERVA has over chemically fueled rockets.

Obviously there are a lot of problems to be solved in designing a gaseous core reactor. For one thing, how can the valuable uranium fuel be kept from being lost through the exhaust nozzle with the hydrogen propellant? A theoretical solution would be to spin the rocket separating the uranium from the hydrogen.

The ultimate in spacecraft power would be the fusion reactor which would use hydrogen both as a reactor fuel and as a rocket propellant. It might even be possible to convert the power of a fusion reactor directly into rocket power.

Both the gaseous core reactor and the fusion reactor are still very much in the theoretical planning stage. So they will have to wait for their turn to come some time after the NERVA has been put to use.

Future historians may look back on the development of nuclear rockets as a step similar to the introduction of steam into ocean transportation. In fact, the nuclear rockets now being planned are quite similar to the early ocean-going steamships which used a combination of old and new power —both steam and sails. ■

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PROTECTION

An "alien technology" is one you don't happen to recognize—no matter how simple or sophisticated it may be.

STEVEN SHAW

Illustrated by Vincent diFate

Historical passage from "The Notes of a Soldier," published in 2569.

"The modern military doctor is now incompetent in the old-fashioned sense. The medic now only has to certify death and arrange for the burial, occasionally. Most modern weapons, if they strike anywhere around the target, do not leave enough of the body to bury. Therefore it is considered futile to give the modern military doctor the training to discover subtle methods of death."

The observer crouched in his bushes and listened as the Piper at the Gates of Dawn started his daily melodies. Near him was the line. He prayed to his gods to help him that day and settled back into a coiled watchfulness.

They were "landed" as usual about five feet off the ground. The scientists hit the ground at odd angles and rolled around like dice. Only the protector had reflexes fast enough to keep him upright. Carefully drilled reflexes.

The observer wondered mildly where they had come from. He had closed his eyes momentarily and hadn't seen them come. He observed that they were dressed in neutral gray-green coveralls. Their possessions had come with them. The observer speculated, while playing with some pebbles and the dirt, that the strangers must normally be very long-lived to collect that many possessions. They wouldn't be collecting any more if they crossed the line.

The scientists set up their equip-

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ment in the clearing that they had landed in and began to test for damage.

The protector flipped through his detection devices and found nothing worth taking an interest in. He noted that all the plants around the clearing were reflecting the sun's energy. He read nothing that was meaningful off the heat detector and presumed that he wouldn't until after dark—if they stayed around that long. He couldn't even tell where the blasted scientists were from the display, though he knew that they were about five feet behind him.

The scientists were continuing their examination of the equipment.

The observer watched the line. He thought about the weather that the gods had sent recently and was thankful. He thought about the meal that his wife would give him at home and was resentful. He thought about the strangers across the line without any emotion at all.

The protector was, in the fashion of all soldiers since time started, trying to scratch. And when the snout of his wrist laser got caught among the scrambler rocket units on his back, his curses would have made all the demons of hell blush.

Once going, the protector never stopped until half an hour later, after venting his emotional energy on his equipment, the scientists, this planet, and devoting ten exclusive minutes to the physical, mental, and moral shortcomings of his superiors. Then he felt much better and was inclined to gaze with benevolent tolerance at the scientists.

The observer watched the verbal pyrotechnic display with grudging admiration. He knew it had to be swearing from the tone, and though he didn't understand the language, he respected the artist who, as far as he could tell, had not once repeated himself. Of course if that artist crossed the line, the observer would have to kill him. Duty was always to be taken seriously.

The protector watched and listened ceaselessly to the jungle. A sudden bird cry or flick of color would have been more than enough to bring out the almost instinctive responses of killing that had been drilled into him.

The observer was patient. As he watched the group, his son came to him and deposited some water. They conversed for a time in the language of hands before he sent his son home. Nothing had happened in the village that morning. The strangers were still performing weird intricate ceremonies on their possessions. The observer

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speculated. The group in the clearing didn't seem to be anxious to move across the line. Maybe he could leave and take a short jog to stretch his legs. The observer finally decided against leaving. If the village Shaman ever learned that he had broken the tradition of the guardians, the Shaman would have him thrown into the river. He shivered in remembrance of others who had been thrown in.

The protector had lost his benevolence. The temperature here is too damn hot! Even the wind that was rising and rattling the leaves was hot. He was now sweating constantly. And he realized quite well, too well, that it wasn't a joke. Under his body armor he was itching where he couldn't scratch. Even slapping hard on the body armor didn't diminish his torment. And the bugs! He had seen some awful bugs on other planets, but these! There were too many of them, they all seemed bent on suicide, and none of them seemed to care if they got slapped. He wished that some scientific jerk would modify the electronic barrier around him. As it was, the barrier stopped nothing but lethal radiations of any sort and metal projectiles. If some scientists would take care of the bugs, he was more than willing to take his chances on bullets and rays.

The insects that hovered overhead were the worst.

Both the protector and the observer waited. The protector watched for anything hostile from the jungle. The observer, from the jungle, watched the group in the glen. The observer noted that one of the group remained detached, circled around, and always faced the jungle. The observer decided that the one who kept apart was a pariah, an outcast. He didn't have any possessions like the others. The pariah didn't even have any weapons.

The scientists were finishing up their equipment check. The protector realized that now they could finish their mineral tests and get back to the ship within an hour or so. He suddenly felt much better. Even some of the bugs were leaving. The rising wind was still as hot as next week's news but at least it was blowing some of the bugs away. He slapped his thigh with his powered gauntlet trying to relieve some of the itching. His eyes scanned the detector readouts. Nothing on any of them. Nothing useful at all.

The observer waited. He took a half-sip of water and watched the strangers. Why didn't they get into the shade? The direct sunlight always was much too hot at this time of day.

The protector snickered. One of those know-it-all scientists was

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heading for a clump of bushes. The egghead hadn't known enough to relieve himself before he left the ship. Now that scientist was going to be bitten by every sort of insect that this crummy planet had. The protector felt like . . .

The observer watched closely. One of the strangers had passed the pariah and was heading for the line. The observer knew his duty.

. . . Laughing his head off. And when the scientist stumbled and fell on his nose he did laugh, and chopped off his laughter when the scientist made no move to get up. The protector checked his instrumentation inside his helmet brim. Heartbeat 0. He had a dead one. He flamed the bushes instantly. Nothing came out screaming. The clump of bushes the scientist had been heading for didn't contain a hostile—if any were around.

He raced through his memory. The scientist had not jerked in any direction, there had been no grunt or scream, there had been no spastic reflex, there had been no noise at all. It had to be a field of some kind. The pre-landing physical ruled out natural death. He was no longer bored.

The strangers made no move to recover their dead. The observer wondered what sort of barbarians these were. The Shaman had demanded that the dead should be taken home in honor and disposed of neatly. The strangers seemed bent on committing grevious acts of outrageous impropriety. First, the pariah was carrying concealed weapons. That was unfair. Second, they crossed the line; and third, they ignore their dead. Barbaric animals!

The protector took a nylon thread and an energy coil from his pocket. An easy underhand throw placed it well beyond the corpse. He hauled it in slowly. The coil would short-circuit the generating mechanism for any sort of field. When the coil was within five feet of him he ordered another scientist to go inspect the body. The scientist approached his dead colleague rather reluctantly. No marks of any sort were visible. Only the redness of the puffed insect bites and the numerous burrs were out of the ordinary and everybody had picked up those. He started back.

The observer nodded to himself in satisfaction. Perhaps the strangers had a taboo about approaching a body too soon after death. At any rate they weren't total barbarians. One of them was going to recover the body. The laws provided for the recovery of the dead.

The observer stiffened in sudden anger when the stranger turned back without the body. He had crossed the line without a valid, lawful reason!

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The scientist died quietly a few feet away from the protector. The insects that were darting around his head flew away when he collapsed.

The protector opened communications with the ship and half spoke, half snarled out a description of the events. While he demanded instructions he watched the jungle half fearfully, his stomach was trying to make a complicated knot.

The main computer on board the ship analyzed the information given and came up with the solution that there were hostile intelligent beings present or involved.

The protector watched happily as the scientists, both living and dead, were recalled to the ship and then five other protectors were dropped.

The observer watched the transpiring events with horror. The two dead men and the other nobles disappeared while more pariahs like the first one materialized. Sorcery! Now the pariahs were in a semicircle and were advancing on the line! Invasion! The observer harkened back to his father's lessons in terror and killed every other one. They all disappeared.

The main computer burbled to itself like a contented idiot. Item: Three out of six weaponry-combat specialists, fully armed, did not survive the engagement. The pattern in which they were killed was every other one traversing from left to right from the front.
Conclusion: Warning given by hostile intelligent beings.
Item: Method of death unknown. Presence of beings responsible undetected.
Conclusion: Advanced technology capable of producing nonmaterial, nondetectable weapons which leave no residue of the means of death within the body.
Advice: Withdraw all exploration groups immediately. Requisition ambassadorial team from Culture-Contact Division.
Note: Reclassify planet as restricted on a Z-5—inhabitants intelligent but hostile—basis.

The starship blasted outwards.

Far below the speeding starship, on an island paradise, the observer crouched in his bushes and listened as the Piper at the Portals of Tomorrow whispered and sang to the wind. He prayed to his gods for a peaceful night.

When the moon rose, round and full, his brother came to take his place. And when he left the line he took with him to his home his blowgun and his pouch of lightly poisoned bamboo slivers. ■

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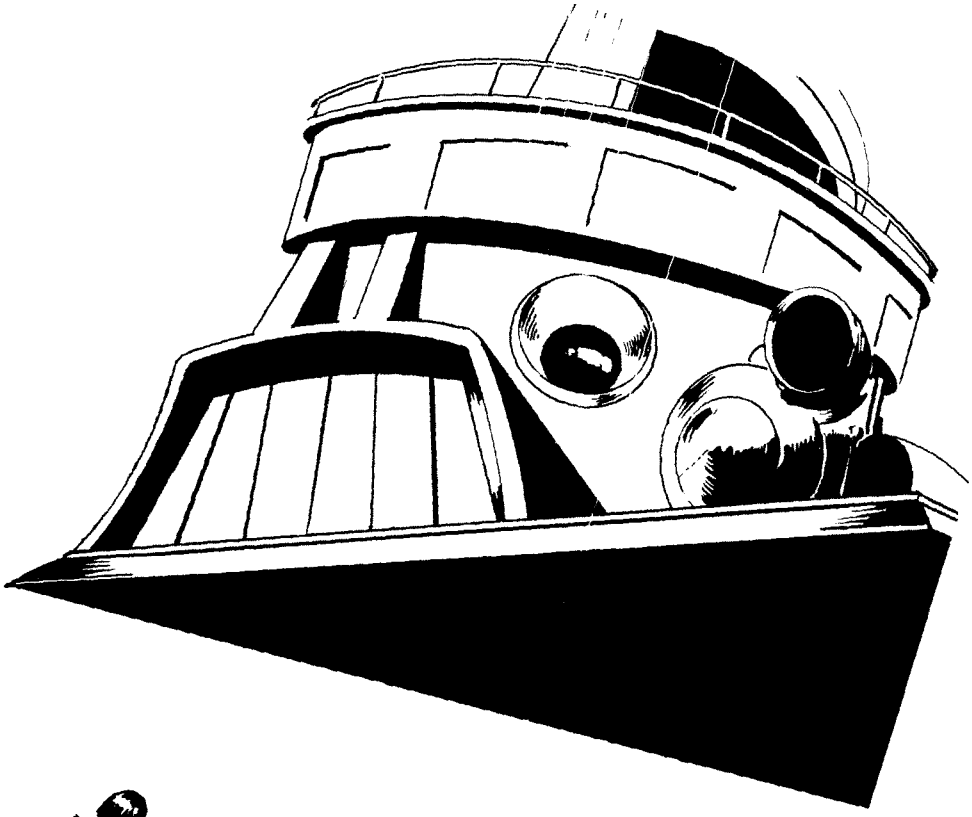

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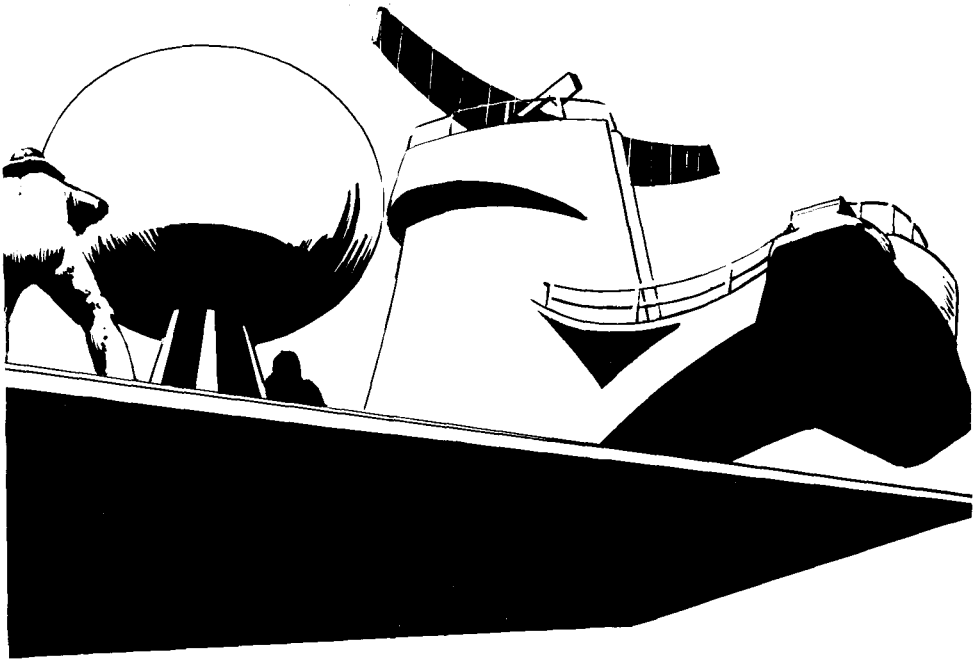

RAVENSHAW OF WBY, INC.

It takes a special sort of man to let logic go to hell—
and act on what he sees, even when he knows it's impossible!

W. MACFARLANE
Illustrated by Vincent diFate

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Ravenshaw sat quietly in a limbo region of the Pentagon and wondered whether his head was stuffed full of shredded polyurethane or large curd cottage cheese. The medical description was circadian rhythm desynchronization. He had been swept through time zones like an auger through an onion, and while his body was present and accounted for in Washington, D.C., he had a disconcerting mental picture of his spirit, winged like the ka of an Egyptian Pharaoh, flapping wearily along behind over the Pacific.

General Craddock lifted his eyes from the 201 file he was studying and peered at Ravenshaw over his glasses. "A British study showed that the only officers who dared to innovate were those with independent fortunes."

"Yes, sir," said Ravenshaw.

He was in the same uniform he had put on eighty miles outside of Saigon. He had drowsed on the jet and borrowed an electric razor from the engineer, and from the reflection he had caught in a glass door, he looked presentable enough. Still, his eyesockets were lined with sand, his skin crawled and he wanted a bath and a bed much more than a chitty-chat with this mysterious two-star general.

"Have you an independent fortune?"

"Independence, sir. No fortune. Independence is a state of mind, sir."

"Hostages to fortune?"

"Only my good opinion of myself."

Ravenshaw had never bandied shorthand conversation with a general before, because he was a polite man and most generals would understand Choctaw as readily, but then, he had never been an anonymous *cause celebre* or been flown halfway around the world without putting foot to the ground, either.

Craddock leaned back in his chair and said, "Ravenshaw, your career has been studded with unorthodoxies like diamonds in a goat's . . . ear. A lieutenant colonel who hires local witch doctors to plant taboos around his battalion area is a little unusual. The ambush you pulled off by tape recording and playing back camp noises, the trick of spreading fluorescent calcites and the use of filtered short-wave ultra-violet light to spot infiltration, all of these things indicate a latitude of mind, a corelative habit of thought that might be put to better use than—" He interrupted himself. "Where did you get the ice-cream machine?"

"I won an LST from the Navy playing poker, sir. I settled for the machine, one hundred seventy-five pounds of mix and a small generator."

"Well, your use of it is anathema in Europe. Large indignant headlines. Certain elements in our country don't like it very well, either. How did that Swedish journalist find out?"

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"She saw children eating strawberry ice-cream cones in the jungle, sir. She backtracked them to my headquarters and watched them swap land mines and booby traps for ice cream. Every Cong within a ten kilometer area had a dozen kids watching him. As soon as he'd plant some device the kids would bring it to me. I had a barnful, sir."

The general took off his glasses and bit an earpiece. "Cones, Ravenshaw?"

"The mess sergeant and I figured out how to bake them. We used an old tractor grill for waffle marks, and cut and rolled them just out of the oven. We packed them in air-tight cans with silica gel and they stayed crisp. Sergeant Kisslegoff deserves the credit, sir. He also liberated a couple of cases of wheat germ for more nutrition in the batter."

"You are a Baby Killer, a Child Murderer, a Pied Piper of Doom. I am quoting from the Reuters' dispatch picked off Tidningarnas Telegrambyra, the Swedish wire service. There's a demonstration going on now in front of the Stockholm embassy. How did you manage to keep your name out of it? According to this indignant female, the battalion was commanded by Colonel Olepoop."

"Yes, sir. That fool lieutenant from Public Relations was new—he was driving her around—and he didn't know us. Kisslegoff is smart. He saw the fire in her eyes when she turned down a scoop of strawberry. The troops and I take care of each other, sir."

"The follow-up reporters can't find the battalion," said Craddock, with satisfaction. "Your Swedish friend stepped on a small anti-personnel mine just yesterday. She will be lying on her stomach for a month and she will be able to show her war wounds"—he hesitated—"I trust, only to intimate friends. You never saw her?"

"No, sir. I was checking perimeter defense."

"The incident is coincidental. Your orders to report to this office were cut before it happened."

Ravenshaw relaxed. He ws surprised he had been so tense. Pragmatic command sometimes demands you sidestep book answers, and getting the job done is not always an acceptable defense. He stifled a yawn, blinked his eyes and snapped to attention at the general's next words.

"I have been looking for a man with peculiar qualifications. You were mentioned by Command and General Staff school. The people at War College had your name at the top of their list. How did you wangle your way into War College, Ravenshaw?"

"Well, sir—" It was an involved story, beginning with an ambassador's wife and a schnauzer dog.

"I'll hear it later. Your schedule

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is already tight. The job I have in mind is experimental, highly discretionary and will establish its own perameters . . . do you understand that term?"

"Form, but not function. It has no precise meaning outside mathematics, but makes an elegant noise."

"Be that as it may. The job is anomalous and the man will make it. Are you interested?" Before Ravenshaw could more than nod, the general added. "Ostensibly you would be a civilian. In fact, you would be on detached duty from here. And while the cover requires pro-rata payments from —never mind who—unvouchered funds are involved." He pushed his glasses back on his head. "It will take a year to decide if I'm sucking wind or gin tonic. Ravenshaw, it is now 2:30. You will report as a civilian at 5:30 at my home in New Glatz, Maryland, for a situational estimate of your character. Today is Friday and you will stay the weekend as my guest. An informal house-party situation. Questions?"

"Does the job have a name, sir?"

"Get it and you can name it. Other questions?"

"Yes, sir," said Ravenshaw in a state of mild euphoria, "can you provide a native guide to get me out of here?"

Arleigh Ravenshaw had goods, clothing, gear and equipment in Vietnam: in Evanston, Illinois, where his brother lived; in St. George, Utah, where he had inherited an old yellow waterstone house from his dead wife, and at the hill ranch near Tassafaranda, California, where he had grown up. He had some tropical sport clothing in his bags at Andrews Air Force Base, but it was more suitable for Hong Kong, or Singapore, than Washington in late September. The pool driver assigned him for the afternoon was familiar only with the main trails of the urban jungle, so Ravenshaw put him in a parking lot and found a bank just before closing time, and a car rental agency and a clothing store by himself. He stopped at a florist and a remarkably good fancy-food store. He had the driver lead him to Andrews, where he picked up his luggage and appropriated a bathroom at a BOQ. He parked his rental behind the guide-dog pool car in front of the general's converted farmhouse in New Glatz at 5:25, dismissed the driver and walked up the winding brick path to the door.

The general's wife answered his knock, a lean woman with calm black eyes, short gray curls and a deep chuckling laugh. She was pleased with the chrysanthemums and not too surprised by the casaba and the grapes. Ravenshaw tentatively pegged her as a domesticated she-wolf, and his regard for the general went up another notch.

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It was just as well his taste ran in that direction, because the other guests were very hard types indeed.

There was an unfashionably fluffy woman named Rosely Dool who bubbled at him and asked loaded questions with a giggle. Her husband, Brinton Dool, had long sideburns to compensate for a balding head. He was happily vague, loosely avant-garde, and his conversation tended to shamble off into unfinished sentences. Aird Dowker was given to pedantic statements, a short man with a brushy moustache parted in the middle. His wife Retta was languishing and sexy in a knit dress and tended to rub against Ravenshaw.

The single woman was Nell Rowley. She had palomino hair and wore a horse-blanket suit to match.

"Do you feel like the new boy at school?" she asked.

"It works both ways," said Ravenshaw. "You are the new fellas at my school. Mark down overweening egocentricity."

Her voice was lovely, light and sweet. "I have a feeling you have been here before."

"Deja vu? No-o, it's just that I enjoy tests, especially when I have inside information."

"You do?"

"The unexamined life is dull," he paraphrased, "and there's nothing more fun than explaining yourself to others. Also, there was that first-class book after World War II on situational testing by the OSS. I enjoyed it."

She was carefully neutral, "You have the job sewed up?"

"Oh, no." He was a little dizzy under the direct inspection of her frost-violet eyes. "You know what you're after and I don't. I can only be myself and you have a job to do. This is all first cabin, high level, very flattering." He wondered if the dizziness was circadian rhythm desynchronization, or one of the body's wonderful warning systems when faced by a formidable woman.

"Suppose you don't meet the requirements?"

"Me get my feelings hurt? Huh-uh. They are your requirements."

She stared into her glass. "Detachment is a rare characteristic," she murmured. "And an unlovely one to most people." He made no comment. "Isn't it?"

"I don't know," he said cheerfully. "May I get you another drink?"

"That should be my line, Colonel. Aren't I supposed to ply you with liquor to loosen your tongue? Yes, I'd like another. Do you have an answer to every question?"

"Yes." Ravenshaw grinned. "I don't know."

"And if you need to know?" she pressed him.

"I am a Rikki-tikki-tavi man. 'Run and Find Out' is the motto tattooed on my heart."

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While the general busied himself with a martini for Nell Rowley—he mixed a very proper five-to-one with Gilbey's and Noilly Prat—Ravenshaw poured his own pale scotch and water. Brinton Dool asked him, "Ah-Colonel, you've been in the mysterious East for some time, and I-ah wonder if you have seen much inexplicable phenomena—"

"Yes, I have, Mr. Dool. Chiefly in the area of human muddleheadedness. I sometimes feel that philosophy should teach each man to take out his heart and look it in the face."

"We all observe our own phenomena," said Dool, surprised into decisiveness by the direct challenge. "I-ah was thinking more in terms of flying-ah saucers—" he reverted.

"No saucers," said Ravenshaw, "but noctilucent clouds, if they fit into your category." Dool was puzzled. "There's no good explanation I know for a luminous cloud in the dead of night. They come in neon blue and hot pink and green and other colors. Those I've seen are lenticular. They go away after a while."

"Anything else along that line?" said the general, pronging three olives on a toothpick.

"Spots of light, sir. Not spots in front of my eyes, but pinpoints of intense fire hanging in the air. They usually vanish with a snap."

"Hallucinations-ah?"

"I've seen them four times and twice the 'hallucinations' were seen by others. They fit my book of inexplicable phenomena."

"Other entries?" asked the general.

"Quite a few, sir. Rhabdomancy is one." They were puzzled. "Witching, dowsing, devining."

Dool looked dismayed. "You don't mean to say you believe—"

Ravenshaw shrugged. "I don't say I can find water or gold with a dowsing stick. For all I know there are little green men with wood magnets upside down in a hollow earth. The stick goes down beyond my control. It's impossible to fake it, and the experiment repeats. This is of first importance."

"But to believe in-ah—"

"Belief is a non sequitur, Mr. Dool, in observed evidence. You have surely considered that an atheist is the truest kind of believer. Excuse me." He returned to Nell Rowley and found her talking with Aird Dowker.

". . . Cycle of revolution," Dowker said, stroking his moustache.

"What do you think of Jefferson's comment that there should be a revolution every generation?" asked Nell.

Ravenshaw was stabbed again by the honey and quinine quality of her voice. "Well, if you leave violence out of the definition, we've been revolving like a bowling ball for a hundred years."

"I was speaking of the real thing," said Dowker.

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"You drive a real automobile and watch real TV."

"Teapot tempests!"

"You have been right, to a degree. Tempests are on the surface. We were locked into the human form and forty-foot waves on an ocean a thousand feet deep have been stimulating only, no matter how obsessed the participants." He turned to Nell. "Mark down tendency to pontificate."

"What do you mean, I have been right?"

"There are depth bombs in the ocean. Molecular biologists may soon force us to consider mankind in a personal, hither-to inviolable area—what is optimum man? And by whose standards? And can a Model T breed a Thunderbird?"

"You are talking nonsense," said Dowker.

"What is your answer?" asked Nell. "Not that I'm sure I understand the question."

Ravenshaw was suddenly weary. "Heigh-ho, alas and also lack-a-day." He wondered where his ka was now. Over Kansas? "The more I know the more I am overwhelmed by my own ignorance."

"Supper," announced Mrs. Craddock.

Nell Rowley spilled half a glass of burgundy on him and Retta Dowker developed roving hands under the tablecloth. Ravenshaw passed her the gravy boat high and suggestively. She glanced at the décolleté of her dress and desisted. After dinner Brinton Dool mounted a dove of peace and zoomed around the room, Aird Dowker drank bourbon and ginger ale and accused Ravenshaw of making passes at his wife, and Nell Rowley shrieked and told him to take his hand off her knee.

Ravenshaw laughed helplessly.

Mrs. Craddock regrouped and reorganized the party in a military manner and the general watched with only an occasional twitch to his lips.

On Saturday Ravenshaw helped the general dig a stump out of the back yard, solemnly observed the four grandchildren who had come visiting, and took the Craddocks to dinner at a French restaurant on Pennsylvania Avenue. There was more yard work on Sunday and that evening the Dools and Dowkers and Craddocks and Nell and Ravenshaw all ate crab and drank beer at Jimmy's. They returned to New Glatz to sit for an hour's idle conversation before the party broke up. The general asked Ravenshaw to join him in a nightcap before the dying fire.

"Ravenshaw, I've got facts up to the ears on a tall giraffe, and Gresham's law was never better illustrated than by computer use for decision making. The cheaper drives out the dearer—silver vanished when the sandwich coins came out—and there's this abysmal inclination to shift command

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responsibility to a computer. Do you know what I'm talking about?"

"The read-out's no better than the in-put. The book can kill you."

The general nodded. "I want to tap an area of information that has never been properly examined, and I want judicious opinion, not a garbage scow full of facts." A log broke and scattered sparks on the hearth. "I don't suppose the fate of nations hangs on our talk tonight, but I have this nagging hunch we'd better explore the wild blue yonder country. It's an easy job in a way, like walking on an edge-up two by four—in the dark, with a flashlight, over the Grand Canyon. My tame psychologists and I agree. You get the job."

"Exactly what is it?"

The general told him, and the fire was ashes and dawn was red before they covered some of the possibilities.

Six months later Ravenshaw opened the door of WBY, Inc., in San Diego, California, at nine o'clock in the morning. Nell Rowley was beating the typewriter at her desk. She was wearing an abominable orange-and-blue plaid dress, which at best was some relief from the corridor outside. It was lined with gray marble, suitable for a necropolis, or an austere kind of hell.

"Good morning, Nell."

"Don't bet on it. You have an old lady in tennis shoes, a bushy-tailed college type, a sneaky-pete, a salesman, and a miner-forty-niner tra-la-la-la Clementine. He phoned." She raised her voice over her drumfire typing. It was another of her disconcerting abilities. "Mail's on your desk and dull as Monday morning."

While he read the mail and indicated answers on the letters for Nell's guidance in his quick engineer's printing, Ravenshaw noted again without prejudice his ability to think the worst of people with no difficulty at all.

Nell Rowley disturbed him. They had flown together around the United States for five weeks, visiting the sixteen companies—Lugard, Rodman-Codman Associates, Havesu Foundry, Rubideaux, Simon Photomultipliers, Lyne Jolley and all the others—and not once had she failed to be anything but the perfect secretary. Her hair was never quite tidy and her taste in clothes was remarkable, but she took notes and kept a business journal, made reservations, never complained and was always efficient. This bothered Ravenshaw, that a behavioral psychologist of better than fair reputation was quite willing to compromise her professional status to further a project that might never achieve its prime objective.

He was standing at the window, scowling at Broadway and the panorama of San Diego bay, when Nell tapped at the door and said

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Mrs. Addison Cutleigh was waiting.

Mrs. Cutleigh wore elegant English walkers, but her stockings were lisle, her dress was cut from a gunnysack, and her hat had colored bangles that tinkled frivolously. Her interest in life was pelagoniums and the reform of the Republican Party, which she regarded as crypto-communist. She wanted assurance that her method of ending the war would not fall into the hands of the Bolsheviks.

"This office is a clearing house for ideas," said Ravenshaw. "Wide Blue Yonder, Incorporated is a joint venture of sixteen small patriotic corporations, who believe that the inspiration and invention of the people of the United States is too often latent for lack of an outlet. We do not charge for the service. We channel your idea to the interested sponsor, or to the appropriate governmental agency. If your suggestion is technical in nature, I must ask you to sign a release before you divulge it."

Mrs. Cutleigh nodded bird-bright approval, glanced around the room for lurking Chinese or Russian agents, and hissed, "Poison oak. Upas apples. Cockleburrs. Dodder. Deadly nightshade!"

It took another twenty minutes to get her out of the office, but she left with a good deal of satisfaction after Ravenshaw produced a Bible and swore her to secrecy.

Nell announced that Jay Hardinge was waiting and asked what was on the old lady's mind. He told her it was another scheme to drop noxious weed seeds on North Vietnam and to be sure Mrs. Cutleigh got an extremely official letter of commendation. Someday he might need an expert in pelagoniums or crypto-communist Republicans.

Jay Hardinge had done his Master's at UCSD in geography and thought it deserved more attention than would be given by the eight people who read the average thesis. It was a method of three-dimensional cartography, and was an obvious and unexploited technique to the best of Ravenshaw's knowledge. He asked the young man what he expected in return. Hardinge said it would be nice to have some jobs to choose from. Ravenshaw set up an appointment ten days hence, dictated six letters to Nell, and felt so good about Jay Hardinge that he gave some very kind advice to the noon appointment, the man Nell called the sneaky-pete.

His name was John Smith and he wanted to sell an industrial process belonging to his employer. He did not seem to realize that his particular industry was a small world and his education and experience made it necessary for him to live in it. Ravenshaw pointed out he was cutting his throat behind his back, but the man left unconvinced. Ravenshaw called Sam

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O'Fuoco, who ran the newsstand in the lobby of the building, and Sam obliged by getting John Smith's license number. When Nell came back from lunch, Ravenshaw left her to check the license and see that proper notation was sent to a sensitive file. Smith's employer was not notified. WBY did not police business morality. Returning from lunch, Nell told him the driver's description did not tally with the owner of the plates, but a friend had a friend and identity had been established. The funny thing was that sneaky-pete's name was John Smith.

"You are the apple of my ojo," said Ravenshaw. "You are the flower of my heart."

"Mr. Polkinghorn is here," she said in her bitter honey voice.

Joe Polkinghorn was that rarity, a salesman who knew what he was talking about. Ravenshaw learned about paper traffic flow, ingenious carbons and flimsies and filing methods. Polkinghorn suggested that the best information was only as good as the use to which it was put, and information entombed was as useful as a file of nuts forgotten by a squirrel. Ravenshaw agreed that most solutions were peripheral, like building schools instead of teachers, and sent him out to see if Nell was interested.

His second phone buzzed, the direct outside line. General Craddock was on the wire. "Why do you want the confidential file?"

"She's too perfect. I don't believe it."

"You've got a hunch? What do you want to know?"

"Start with date of birth, parents, brothers and sisters, Sunday School classmates, everything."

"No can do," said Craddock. "You'll get the file by courier this afternoon at your apartment but the first five or six years of her life are blank. I don't know who her parents are, and neither does she."

Nell said, "Mr. Joruve is here." Ravenshaw held up his hand with the fingers apart and she nodded and closed the door.

"The record starts on April 16, 1947. Total anterograde amnesia. Couldn't talk, couldn't dress herself, total retrogression. Worked on her for a year at Houston. Ward of the state. Nothing ever found out about her. Probably the whole family was wiped out. The figures are imprecise—about five hundred fifty killed."

"You lost me on the first curve."

"The Texas City explosion and fire. They found her crawling along a gutter near the waterfront with most of her hair burned off, mewing like a kitten."

"Be damned."

"So that's that. I talked with Ed Mollison yesterday in New York. He's very enthusiastic about the rolamite application you sent Lugard. Have you turned up anything for me?"

"Negative."

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The general sighed three thousand miles away. "Don't take any wooden dimes—inflation," he said and hung up.

Nell announced, "Mr. Charles Joruve." He was a small boney man in his early seventies with a walloping beak of a nose. He had a black felt hat in his hand and a shopping bag in the crook of his arm. One bright blue eye was slightly cocked.

"Paper said you were honest and would listen to anything. That right?"

Ravenshaw grinned and said he was only reasonably honest, but he always did what he said he would do. Honesty is intention, but his word was his word.

"Fair enough. Now tell me, how does this place work?"

Ravenshaw explained that WBY was supported by companies whose research and development funds were limited. The office cost was shared pro rata, with a percentage assessment against originated ideas up to twenty-five percent of the base expense. He mentioned the machine that crawled upstairs with a refrigerator—for instance—on its back.

"What do you get out of this?" asked Joruve with bluejay curiosity."

"Wages, a chance to try my judgment, and a very small percentage of successful developments."

"Shrewd. I guess you're my man," said Joruve. "I want to get a jeep out of this thing, but I don't suppose I will. What I don't want to get is tooken. Maybe what I really need is advice." He reached into the paper bag and lifted out a black box. "What do you think?"

A black boxer walked into the office about twice a month. Ravenshaw had come to regard them as a side benefit, an unearned increment, a keep-the-spirit-of-Christmas-in-your-heart sort of lagniappe to his job. One man walked in with a cosmic ray to 110-120 AC black box complete with a socket on the side. He wanted ten thousand dollars in small bills laid in his hand for a demonstration. Unlimited free power, he said. Ravenshaw called in Nell and told her to get the money and a three-way plug. More in sorrow than anger, the man put his box back into the case, locked it, chained it to his wrist and left, shaking his head sadly at scoffers.

A pathetic black boxer had made a money machine from which he cranked a worn five dollar bill. He excused himself to the washroom before he could insert another piece of paper and crank out the same bill. There were others, but Ravenshaw especially liked the one who had worn overalls and a straw hat. He put boll cotton into his black box, pushed a button so lights flashed and gears growled, and dramatically pulled

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out a pillowcase. With development money, he would make a box large enough to manufacture sheets. To Ravenshaw's vast pleasure, he had a little drawer at the bottom from which he removed the cleaned cotton seed.

Ravenshaw admired the black boxers' ingenuity and beguiling sense of wonder. They reinforced his faith in the innocent, indomitable spirit of man. He was a little surprised by Joruve's black box because the buildup was far from typical. "Cosmic rays to electricity?" he asked.

"Don't know," said Joruve, "I found it making a molino de dios, but other things sure happen." He set the box on a corner of the desk and twiddled with the side.

Until this moment it had been an ordinary day for Ravenshaw. He had finally phoned Washington about Nell Rowley, he had lunch with Fabio Marquien, a sharpshooter who worked both sides of the border, and his customers had been run-of-the-mill customers. There was nothing unusual about Joruve.

This black box was a different horse. An atavistic shudder raised the hair on the back of his head. The box was wider than it should have been wide. The handle was offset to one end. It was traditionally black—and seamless—but the finish was deep, and concentrated light to a single black-green shimmer at one end of the rounded edge. Ravenshaw stood slowly to change his angle of vision, and where the Jo-block smooth top would normally have reflected a sheen of light from the window, it was concentrated into a crawling green shimmer. The handle rose from a shallow indentation. Ravenshaw gingerly touched it with a finger and it retracted into the hollow, leaving a flat surface.

"Hey, now," said Joruve, "feel this."

There was a surge of arctic air from an opening at the end of the box, as if a window, had been left unclosed on top of Greenland's icy mountains. It was not like a man whistling, but a turbulent flow, as if a frost giant was endlessly exhaling.

"How about that," said Joruve.

"Cold," said Ravenshaw. He pushed the handle down.

Joruve fumbled at the side of the box and the oriface instantly blew hot air. "Is that all the hotter?" said Ravenshaw absently.

Joruve stuck out his lower lip and twiddled again. A wind from a blast furnace filled the room. Joruve raised his eyebrows and winked his cocked eye. Ravenshaw lifted his hands waist high and shrugged. He had all the moves of a broken-field used-car salesman. Joruve snorted and turned off the furnace blast. He took a pair of steel-rimmed spectacles from his pocket.

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"All right, all right," he said and peered closely at the side. "Now, lessee. I never fooled with this thing before—" He turned the box on the desk, the business end toward Ravenshaw. "Now. Maybe something will happen."

What happened was a solid bar of water. It hit Ravenshaw hip high and spun him like a dervish over the chair and off the files into a corner of the room. The firehose stream smashed against the wall and filled the air with water, fog, mist and gouts of spray. Joruve started toward him, was caught in the water and tumbled like a bug in a mixmaster. Niagara Falls thundered. Suddenly the flow shut off.

"Arleigh Ravenshaw, what are you *doing?*"

Water ran off the desk, dripped from the ceiling and sparkled on the windows. The carpet was sodden and so was Ravenshaw. He squelched as he walked to Nell Rowley and the box. "Crazy thing hasn't moved," he said in the dripping silence. "Takes two firemen to hold a blast like that." He squeegeed his face and head with both hands. "What happened to the opposite and equal reaction?"

Nell said, "I don't know. Never saw it. You had it last." She was thoroughly wet and the plaid dress looked much better clinging to her body.

"Did you turn the thing off?" He

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patted the box. The handle went flat and a trickle ran down the side. She raised her eyebrows. He dismissed the problem.

"Phone down and hold me a taxi. Call Hardy for a cleanup squad, get a cashier's check from the bank made out to Charles Joruve for five thousand dollars, type a release for his signature, bring both to my apartment. Questions?" This was Colonel Ravenshaw in command. Nell wheeled and went to her desk while he plucked Joruve out of the corner —he was feebly stirring—and marched him like a rubber-legged doll into the waiting room.

"How do I explain all that?" asked Nell.

He leaned Joruve against a wall and returned to his desk. He opened a bottom drawer and pulled out a sample campfire starter a happy pyromaniac had invented and brought to him a month before. He pulled the tab and it blazed a tongue of fire and sparks three feet long. He held it to the sprinkler head in the ceiling. The metal melted and a heavy rain started, twenty gallons a minute. He doused the starter in a wastebasket half full of water.

"Damn carelessness." He wrapped the black box in his coat, set the soggy black hat on Joruve's head, and steered the old man out the door while Nell phoned Building Maintenance to turn off the sprinkler.

Sitting in the desert at four o'clock in the morning, up to his arms in a sleeping bag, Ravenshaw reviewed his assumptions. With a great deal of effort he had got himself to his present position on the side of a rocky hill. Far across the badlands and beyond the dry lake a truck was heading east, its lights brave and lonely in the dark night. The moon had set an hour before. There was a dim halation over Superstition Mountain from the Imperial valley towns.

The black box should be in Washington by now.

The courier who delivered the confidential file on Nell Rowley seemed to be an imperturbable young man, but his eyes narrowed when General Craddock told him on the phone to report to Lindbergh Field within twenty minutes to catch an Air Force interceptor. He hefted the suitcase into which Ravenshaw had packed the black box between two pillows. "Hot as a three dollar pistol," he estimated, and checked the aluminum frame .32 he kept in a chamois-lined front pocket and the .38 from a clamshell at his belt.

Craddock said to Ravenshaw, "You better take Nell for liaison. I will have two unflappable men in Borrego by noon tomorrow. Nell can guide them to your stakeout. How is Mr. Joruve?"

"He's sitting in a chair wrapped in a blanket with a tumbler of Cutty Sark in his hand. He says

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he likes Haig better. When I leased this place, I never figured I'd use the drier, but everything he owns is tumbling around in it now, except his hat."

"Is he—safe?"

"He was a kid sharpshooter with a star-gauged Springfield in World War I. He was with the Seabees in the Second. He's got a motto tattooed on his heart, 'My Country Right or Wrong, My Mother Drunk or Sober.' "

"Where did he find the thing? Are there more?"

"Sir, I think it's rare as a dollar bill with an eagle egg instead of an eye on top of the pyramid. He says he found it squirting dust in the Santa Rosa foothills, right on top of the ground."

"What was he doing there?"

"I asked that question." Ravenshaw took a deep breath. "He's been a prospector a long time. For a vacation he goes Peg-leg Smithing. Peg-leg was the fellow who brought in gold nuggets covered with black varnish. His real name was Thomas L. Smith of Garard County, Kentucky. Joruve figured that Peg-leg wouldn't go anywhere a horse or mule couldn't go, and—"

"Garbage scow full of facts." Ravenshaw could hear the tapping of eyeglass earpieces on the desk. "I suppose you'll tell me next what his leg was made of."

"Juniper, sir." There was a growling noise that could have been atmospherics. "The gold was covered with sulphur dioxide and there's some speculation it was radioactive." The tapping slowed ominously. "There's a story of an Indian woman from Warner Springs who found similar nuggets at a location where she could see the smoke from an SP locomotive taking on water at Salton, before the tracks and the station were covered by the Salton Sea."

"Gigo! Computer people tell me Garbage In, Garbage Out. Ravenshaw, you rationalize these facts. Good-bye."

A cold, soft wind was beginning to blow and Ravenshaw was pleased with his foresight in buying the sleeping bags. Nell Rowley sat beside him. Charlie Joruve was in a sandy patch behind a large boulder. He was a quiet sleeper. Ravenshaw had heard only a few muted snores before the old man turned and was quiet again.

The rest of yesterday evening was blurred by incident. When Nell arrived, it developed that she had no suitable outdoor clothing. When Joruve was dry outside—though wet within—they went to a shopping center, where Nell bought boots and pants and sweaters and a windbreaker, in colors that made Ravenshaw wince. He bought sleeping bags, some nylon line, bar chocolate and a couple of thermos bottles. Joruve wanted to buy everyone a drink and he did when they

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met with their purchases at a restaurant. The old man was exhilarated by the lights and the music and the opulent display of goods in the crystal windows as they walked through the arcades to Ravenshaw's car after dinner. He even did a few dance steps with Nell on the swirl-patterned terrazzo walk. She was burning with a hard, gemlike flame and her bitter honey voice was plangent—Ravenshaw thought those terms were suitable only to turn-of-the-century novelists, but they swam to the top of his mind like great gawping carp when he tried to put his finger on her manner that evening.

The traffic diminished as they left the freeway to twist and climb through the rock-boned hills of San Diego County. The roads grew more lonely and there was almost no traffic by the time they wound down and down to Borrego on the eastern slope of the mountains. Ravenshaw had the thermos bottles filled with coffee at a drowsy restaurant about to close for the night. He parked under a Security light at the county airport. He re-rolled and tied the sleeping bags with their own cords to horse-collar packs, and transferred the gear to Joruve's old Ford, dusty and battered, but with wide tires and good clearance for rough country travel.

The moon was low and black shadows engulfed them when Joruve turned off the road up a nameless wash, and began to pick a way over the sandy gravel around boulders and through the sparse brush. "Hang on," he said as the car lurched over a section of random cobbles. "Been meaning to ask. What's the hurry?"

"Johnny at the rat hole," said Ravenshaw, bracing Nell as they crawled along a slab of rock with a 30° tilt to the side. "Go where the action is. The first principle in fishing is finding water."

"Simple Simon." Nell pushed her hair back into place. "You are an exponent of the obvious, Mr. Ravenshaw."

"Damn right," said Joruve, unexpectedly. "The obvious is what's tricky. The obvious is what snaps at your um . . . heels when you're not looking. Why, I remember—" he interrupted himself. "Here's what we've been looking for. End of the line, gang. We walk from here." He turned the car into a sidewall, backed around and parked heading down the arroyo.

Ravenshaw nodded. "Exit pursued by a bear," he said, and wondered if some ursine alien had lost the black box. Joruve led the way up a fall of rock and along the side of a hill. He warned them against cat's claw and cholla cactus, pointed out a clump of Spanish bayonet and told them to regard all vegetation as a lovesick porcupine until proven innocent.

Something moved. Nell gasped. Ravenshaw ran to her side and stumbled on a rock. When you find

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an artifact, like a Folsom or Sandia point, you do not expect the owner to stick his head around a bush. Ravenshaw leaped to his feet in front of Nell and turned on his flashlight. The movement was from a bread wrapper caught against a bush, quiet now that a breath of wind had stopped.

A rock dike ran across the open end of the horseshoe flat. Joruve led them to a clump of beaver-tail cactus by which he had found the black box. They searched the area enclosed by rocky hills and then climbed one of the horseshoe heels and had a cup of coffee before they settled down in their sleeping bags for the rest of the night. Ravenshaw could not sleep. The bread wrapper had set up a noise somewhere in his mind like fingernails running down a slate blackboard.

The black box was not a product of any technology he knew. It was an alien artifact. If saucer men had left it here, were they real men, or were they wearing the skins of men as Aztec priests did? He turned to the more cheerful consideration that the box had been manufactured by extramundane octopi or giant spiders. It was made to be used by something with delicate manual control—hands, feelers, tentacles?

Alien to what? To now, to this time and place. It might be a leftover Lemurian product, or an artifact from Mu or Atlantis washed out of the cobble matrix by winter rains. So why was it raising a dust devil?

Or perhaps a fellow on a bicycle had dropped it—Mr. Wells's time machine bicycle, of course. Ravenshaw tried to imagine a short randy man in a high collar and a Norfolk jacket peddling over the weary years to this howling wilderness. He shifted his weight on the hard rock and the hank of nylon bit into his hip. He moved again. He assured himself wryly, as he had in the past, something will happen.

According to the Arabs, day separates from night when you can distinguish between a black horse hair and a white laid on the palm of your hand, but Nell Rowley was a palomino and the stars were gone before the light showed the color of her hair. As usual, it was untidy. She said, "I made a list of your appointments and called a Kelly Girl to cancel them. She'll be in the office today to baby-sit the telephone. I left the key with Sam O'Fuoco."

"You are the sun of my days," said Ravenshaw. He wondered fleetingly why he translated compliments to Nell directly from a foreign tongue. "Would you rather go to Borrego now or later? You could grab breakfast and a motel and a nap before noon."

"I'll stay if there's more coffee. Are there snakes?" She warmed her hands on the cup. "It's been bothering me."

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"Yes, but it's too cold for them." The sky was bright now, and he could have seen the frost-violet of her eyes over the rim of the plastic cup, but he was wondering if instead of giant spiders, the owners of the black box were—maybe—giant snakes with hands.

Charlie Joruve said he was not interested in a chocolate bar for breakfast or any other time, and he and Ravenshaw carried the sleeping bags and empty thermos bottles to the car, leaving Nell on watch. She sat between two boulders in the early sun, still with the curious alertness, the waiting tension Ravenshaw had noted the night before.

Back at the horseshoe flat, with Joruve scheduled to return at about eleven, all Ravenshaw's apprehensions of the past night seemed foolish. Nell was preoccupied as she slowly combed her hair and he walked the enclosure again and climbed the other heel to inspect a magnificent chartreuse blossom on a cholla cactus. The ocotillo were exclamations of burning orange-red bloom. He was attracted to a desert lily and then noticed a patch of bellyflowers. He was on his stomach behind a creosote bush when he heard a hissing noise like a carbon arc light on a dead-still summer night. He raised his head. It was a serious noise, as the buzz of a rattlesnake is serious, and it stopped short with a pop.

Tilted to a near right angle at Nell's side of the horseshoe, was a room without walls. A man was sitting in a chair behing a panel of instruments arranged like the keyboard of a Wurlitzer organ, and to his side stood a child with a black eye holding a tray. They were oriented to the floor on which they stood and showed no surprise to find themselves almost horizontal to the sand below them. There were tall cabinets of alternating orange and plum color at the rear of the room nearest the ground. There were improbably shaped masses as foreign to Ravenshaw's eye as a Volkswagen would have been to Charles Duryea. The child held out the tray to the man. He raised the container to his lips while he studied the instrument console. The whole room was drifting toward Ravenshaw.

The man turned, spat on the floor and threw the contents of the glass at the child. It was a red liquid that splashed and ran down the invisible wall to the floor. It ran to the south from Ravenshaw's viewpoint and he felt a moment of vertigo. There was no sound as the man opened his mouth and cursed. The child stood stolidly on one foot with the instep of the other pressed against her knee. The man glanced at the ground and touched a control tab on the console. The entire room was less than fifty feet from Ravenshaw when it turned blue-gray and disappeared in a small clap of thunder.

Ravenshaw began to breathe

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again and looked at a bellyflower in front of his nose. It had four petals shading from purple to pink to white in the center. It was about as large as a sixteen-penny nail head. He had an idea that the shape and colors were indelibly printed on his mind.

What happened to Nell?

She was weeping bitterly between the two rocks, her body shaken by great wracking sobs. He dropped to his knees before her, gulping air. A desk-jockey job is not the best training for the hundred-yard dash through soft sand.

"Did you see them?" she wailed. "The girl and the Drishna. They're gone and they left me here. Why didn't you stop them?" The ice princess had melted in bitter hot tears. She snatched the handkerchief he held out and ripped it in two. "Keep your cool! Keep your cool," she said. "I'll tell you this, detachment is denial and denial is death! Why didn't you stop them?"

"What were those little sparkles of fire on the walls?"

"They're gone and I am desolate —get your hand off my shoulder, you gibbering cucumber! I am lost and wretched—go away!"

"Girl?" The child had been dressed in silk sacking with a loose blouse, tight sleeves and baggy pants. The material was apricot color with shifting poisonous blue flashes wherever it folded. The man was wearing a smooth dove-gray fabric, a wide thick fuchsia belt, fuchsia piping from ankles to wrists and a high, thick, fuchsia collar. "Drishna?"

Nell was not listening. She was taut with some internal argumentation. She did not see him. Ravenshaw sighed and stood up. He walked to the area where the tilted room had appeared. It was warm in the morning sun and the first midges of the year swarmed in the quiet air. He waved his hand in front of his face. Joruve called this the Borrego salute and said that strangers thought it the friendliest place in the world, in season. The Salton Sea was a line of blue under the Chocolate mountains.

Nell came up behind him. "Arleigh, I'm sorry. I don't know what got into me. I am altogether mixed up. I am a pig."

"It makes no never mind."

"My head split when I saw that room. Somewhere and sometime I have been here before—galloping on the back of a nightmare—and the girl and that monster are familiar to me as my face in a mirror —and the loneliness—and the rocks on my knees—"

"It is not to worry, querida," said Ravenshaw softly. He lifted his head.

She went on in her honey voice, "Children—especially orphans—often dream they were kidnapped, and their true and loving parents are the King and his consort of Cockaigne—"

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"Back to the rocks!" said Ravenshaw. The buzz had begun again.

The carbon arc noise grew louder as they ran and the absurd "pop" followed more quickly than before. They turned and there was the room on an even keel. The man was in rich red clothing with dull green piping and belt and collar, and the girl wore an acid yellow garment. The man nodded to them. He punched a tab on the Wurlitzer.

The random flashes of gnats intersecting the walls stopped when the room settled to the ground. A rectangular section became even more transparent. The man stepped to the sand. He was a young Roman emperor, sleek and a little corpulent, his dark hair a cap of curls. His eyes were at once lazy and feral, like those of a well-fed lion blinking at a flock of sheep.

"Ullo-ullo-ullo," he said. "You've already stolen the nesial node interphaser. Well enough. It brought you here. Fair exchange is no thievery. Abandon that expression of insolent ignorance. Answer my question. Where is the iodine?"

Ravenshaw gawped. He had opened his mouth to say good morning, and glanced at Nell. She was standing on one leg with the other foot pressed against the inside of her knee.

"Popocatepetl istaccihuatl xochimilco?"

"Duh? Whad you say?" Ravenshaw gulped.

"Albionese. Well enough, churd. I don't care for Nahuatl either. Uto-Aztecans are greedy buggers. Where's the iodine on this rotten shim world? I need two puncheons of it."

"Wha-wha—"

"'Save me," said the man, lifting his eyes to heaven. He spoke with exaggerated care, as to a retarded child, "Number 53, churd, orthorhombic crystal structure, violet vapor, extracted from seaweed, brines and the caliche of that preposterous desert at the end of the southern continent." The amber eyes grew sharper. "Don't try my patience, churd. You're wearing a time mensuration devise on your wrist, your clothing is mass produced, your bitch is Mier which passes understanding, you're a contumacious quark and my patience wears thin. There was no orthoentric alarm, so your contingency's not travelers. Iodine, churd?"

"From Chile," said Ravenshaw jerkily. "In ships to the gulf coast. Chief port of entry across from Galveston. Calcium nitrate. Ships full of it. Caliche." Nell was still standing on one leg with a blank expression on her face.

The man spoke in a language unknown to Ravenshaw and the girl in the room took her foot from her knee and brought a large flat box to the man. She knelt before him. He tapped it and beckoned to Ravenshaw. It was a relief map with no political designations. Ra-

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venshaw put his finger on Galveston Bay and the man tapped the box again. The scale changed and Ravenshaw indicated the mainland coast to the west. The man waved Ravenshaw back and turned two dials until a spot of light was exactly where Ravenshaw had pointed. The man touched a plate to one side of the map and coordinates appeared. A plate on the other side burned red and then green as he made another adjustment. Elevation? Ravenshaw wondered. The girl carried the box back to the room and locked it into the console.

The man spoke again and she walked to one of the plum colored cabinets. She glanced furtively over her shoulder at Nell and fumbled with the handle of the device she took from the cabinet. Then she brought it to the man and stood behind him to one side.

"The Mier are intractable, recalcitrant and rare," observed the man, polishing his nails on his sleeve. "Training them from anarchy to obedience is a burden. Only recently I discovered this girl with her hands in the machinery—and she will not learn easily to properly prepare a drink." He held his fingernails up to admire them. "Yours seems well trained. Perhaps, as with elephants, they work better in pairs." He looked Ravenshaw in the eye. "I'll take your Mier."

Ravenshaw pushed Nell and she toppled like a tree. The Roman emperor watched her fall. Ravenshaw did not. He stooped and hurled a jagged, baseball-size rock. It should have caught the man in the throat. Ravenshaw was sure of this because it slowed and stopped there before it fell to the ground. If the last foot of travel had been made of invisible foam rubber, the result would have been the same.

The man laughed and shot Ravenshaw. Then he shot Nell.

It was a humane weapon, Ravenshaw thought in confusion, like those traps to catch birds or animals harmlessly. As a boy he had known a neighbor who deplored the use of firearms. The fellow was highly moral about it. Shoot innocent creatures? Horrible! Ravenshaw was no less confused when he passed the neighbor's farm one day and found the tender heart, having caught a ground squirrel harmlessly, beating it to death with a baseball bat.

The involuntary muscles were not affected, but he had lost control over his body. He continued breathing and his heart must be going, but he was selectively short-circuited. As his thoughts unmuddled, he found his eyes were open and his ears plugged in. He did not worry about a baseball bat, because he did not think the alien carried one with him. He did worry about elapsed time—enough events for a whole day had been

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jammed into a few minutes—but when he saw the girl bring a glass of the red liquid to the man and take the weapon from him, Ravenshaw concluded he had been only momentarily unconscious.

"You . . . will . . . speak . . . Albionese," said the man slowly. The girl said nothing. He slapped her face with an open hand. She staggered and stood straight again. "You . . . will . . . speak . . . nothing . . . else . . . until . . . you . . . learn." With a quick blow he slapped the other side of her face. She fell this time. Ravenshaw tried to speak. He tried to move his fingers. He could wiggle his right toes but not his left—and flex his foot—and knee and thigh. So now he could roll over onto his stomach. What for?

The man turned to Ravenshaw and nudged him in the ribs with a foot. "Desynchronizer, churd, for an overweening aborigine. Considering your gross bulk, a full charge should give you two days in which to meditate on courtesy. You may not die. The little ants will keep you amused as you lie there" —he poured the last of his sweet drink on Ravenshaw's face—"and afterward the buzzards. While I am educating your Mier, your last sight will be of a buzzard's beak. They go for the eyes first, I understand. Then the other soft parts. Next the ants and dehydration. Oh, well, keep hope alive in your heart. You may die, churd." He stepped away and said to the girl, "Drag . . . that . . . Mier . . . by . . . the . . . arm—"

Ravenshaw flexed his knee, pushed himself over onto his stomach and flailed out with his leg. He caught the man in the ankles and ripped his feet out from under him. He did a bellyflop onto the sand. Ravenshaw scrabbled to him. He threw himself across the man's head and seized a wrist, which he pulled up his back between his shoulder blades. The other hand tore at the sand.

The protective device built into the suit was a reverse inertial reel, Ravenshaw speculated, and to check this theory he pounded a fist at the man's head. His body was working very well, but the blow stopped short. He pushed gently and had no trouble forcing the face into the sand. He flipped himself to a kneeling position on the man's back, keeping a steady pressure on the wrist. He was perfectly willing to break the arm, or dislocate the shoulder. He had always admired the implicit promise on the only snake flag he knew about: Don't Tread On Me.

The girl was on her knees beside Nell, brushing sand from her cheek. The child looked puzzled and deeply concerned, the first expression he had seen on her face. The day was growing warmer. Ravenshaw saw a pair of buzzards in the sky and turned his attention back to the man under him. He had stopped

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thrashing, but he made sandy gobbling noises. Ravenshaw pulled the hank of nylon line from his pocket and began to bite off the plastic wrapper. The man tried to lurch forward and Ravenshaw heard a slight creaking noise when he pushed the wrist higher. The feet drummed. Ravenshaw tried to slug him with the nylon hank and failed. It took a little while to run a simple loop around his neck and secure both hands under the shoulder blades. "If a job is worth doing—" muttered Ravenshaw, and he did not scamp the job. Then he got up and stretched. The girl had brought a cushion from the room and put it under Nell's head. She shaded her face while she waited.

Ravenshaw shoved the man over onto his back and said, "You will speak only Albionese. You will answer my questions." The man rolled his eyes, spat sand and wept. His tongue was not very sandy, considering how he had been whooping and gulping. Ravenshaw waited until his eyes settled to a feral glare. He took a three-bladed knife from his pocket and opened the longest blade. He picked up a flat rock and began to whet the edge. *Wheet-wheet-wheet.* "The first question is, where do you come from?" *Wheet-wheet-wheet.* The sun caught the edge of the blade nicely.

"Grauok." The loop was cutting into his throat. Ravenshaw put two fingers under the line and pulled. The man arched his back and yelled. Ravenshaw heaved him onto his face again and undid the loop. He pulled the wrists down as far as they would go, ran the line between his legs, over the back of his shoulder and around the neck and back down again. He tied it off at the wrists and tied the two lines together at the back of the neck. If he lifted his wrists, he would saw himself in two. Or strangle. Ravenshaw was pleased with this arrangement. He turned him over again onto a small barrel cactus. He went back to sharpening his knife while the man yelped and writhed away. "Where do you come from," said Ravenshaw. *Wheet-wheet-wheet.*

"I will kill you horrid!" choked the man.

Ravenshaw tugged on one of the lines.

"Grauok . . . Ang 3207 Nag 4862 . . . kill me . . . I'll tell you no more—"

Ravenshaw continued to whet his knife. "I will slit your nose first," he said conversationally. "I have other things in mind when that is done." Ravenshaw slowly touched his nose with the blade. A drop of blood formed. He used it to lubricate the stone. "What is a shim world?" *Wheet-wheet-wheet.*

"Any fool knows. One in the infinity of worlds, churd."

"Errr," growled Ravenshaw.

The man coughed rackingly.

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When he stopped, his eyes went to the knife. *Wheet-wheet-wheet.* Ravenshaw tested the edge with his thumb and smiled. He shaved a patch of hair from his arm and shook his head. *Wheet-wheet-wheet.* It was not a loud noise, but it was also a serious noise and a subtle one.

"Uh, citizen—elementary explanation is bird who comes to sharpen beak on mountain every hundred years. When mountain is worn down, it is still as nothing in infinity—" His eyes were hypnotized by the knife.

"Shim worlds?" said Ravenshaw softly.

"In our early technology we used multiple layers of metal—shims—to achieve a fit. Shim worlds—you peel them apart with gravity wave multiphaser—we are the Drishna—we are the travelers—will you please stop that—please?"

"Time travel," said Ravenshaw.

"Stupid churd! Time travel is impossible!"

Ravenshaw began to whistle thoughtfully. He bent his whole attention to the very delicate sharpening of the blade. *Wheeta-wheeta.* He looked down and then quickly away. His eyes met those of the girl bending over Nell.

"Aah-ha, aah-ha," the man sucked in air.

Ravenshaw was suddenly appalled. He saw the girl clearly for the first time. Her short hair was a deep gold color. Her eyes were violet. She and Nell made an extraordinary picture with the high blue sky of the desert behind them. Ravenshaw thought furiously. He waved the knife toward the man's nose and the resistance field stopped his hand. He turned a tiger face to his prisoner.

The man sucked in his breath and his mouth trembled. He spoke placatingly, rapidly, in a soft whining voice. "You are right, muh-master. Philosophic theory of the most advanced thinkers . . . aah . . . pup-postulates the master world on which all others are contingent . . . aah . . . from which all innovation flows . . . aah . . . from that world time travel is certainly possible . . . aah . . . take that knife away!"

"Errr."

"I'll give you anything, master. Nesial node interphaser in perfect condition. Not flawed as the one you . . . aah . . . graciously accepted. It will bring you gold, master, from five hundred blics with a pood wide face . . . I made nuggets . . . take it, master!"

Ravenshaw was silent. Nell moaned softly. "Why didn't you get iodine that way," he asked absently.

"It's 28th common, but even on an untouched shim world it takes time. On some it takes years." With Ravenshaw's abstraction, he spoke with a tentative confidence. "I will make you master of your

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world with weapons. The desynchronizer alone, when properly charged, will . . . that bitch! A partially regenerated cartridge! That little bitch!"

"What year is it?" snapped Ravenshaw with a scowl.

Fear flooded back. "Aah . . . 1947 from the birth of Christ . . . your system is better, I'm sure . . . take the Mier, too . . . they're a nicely matched pair . . . what command system do you use . . . certainly an elegant method . . . Mier are not common . . . very expensive . . . you must be a wealthy man, master . . . I will make you richer—" He was babbling and spitum ran down the corner of his mouth.

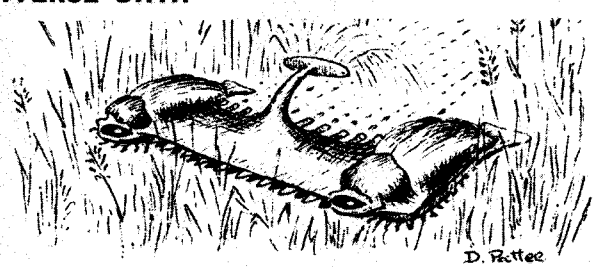
Nell spoke. "Arleigh," she said. Her voice was piercing sweet. "Arleigh?" Nell's eyes were tightly shut.

Ravenshaw made his decision. The girl stood. He pantomimed drinking a glass of water. Their eyes met. Nineteen forty-seven, was it? She turned and entered the room with all its treasures. Ravenshaw knelt beside Nell. He unwrapped the nylon line from his fist. He held it loosely in his hand. When it jerked through, he let it go.

The man was running, bent over, to the room. The girl stood in the transparent doorway with an anguished face and he threw his shoulder into her stomach. She sprawled against an orange cabinet. He flung himself into the chair behind the Wurlitzer console and hit the tab on the map box with his chin.

Sparkles of light appeared as

DEPARTMENT OF DIVERSE DATA



COLEOPTERIX HORTATOR BIFRONS or "DOUBLE BUG"
(Sometimes referred to as "THE LAWNMOWER")
E.T. from Achernar IV. An insect highly destructive to vegetation. Fortunately, his metabolism is so rapid that he reseeds, waters and fertilizes as he goes.

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gnats intersected the wall. The man looked up and sneered triumphantly at Ravenshaw. The room turned blue-gray and disappeared with a small clap of thunder. Dust rose into the air and drifted away.

Nell had her eyes open. "You let him take the girl." Her lips curled. "I will never forgive you." Her violet eyes were never colder, her honey voice never more bitter.

Late that afternoon, Ravenshaw slumped in a chair in General Craddock's office and finished his report, ". . . So we went back to San Diego, leaving your two men to keep an eye on the place. But I can guarantee you, nothing more will happen."

"Uh-huh?" The general took off his glasses and slipped them into a case. He took a new pair from his desk and put them on.

"What I know is, the girl was Nell herself. Twenty-two years ago. Her existence was contingent . . . I think . . . on something not yet certain. That's why I let them go. On the best evidence, the girl got out of that room before it drifted into the nitrate ship. In 1947, in Texas City."

"Ravenshaw, for the record now —which I think will be decently buried—is everything you said the truth?"

Ravenshaw grinned wearily. "Except that they extract the iodine before the nitrate leaves Chile. Shim worlds? Scrambled time? Take your own best hold. All the proof there is, is a Mier and a black box. And she may be irrecoverable as yesterday—if that means anything anymore."

"Why did she come to work here?"

"If you're interested in inexplicable phenomena, you go where they collect inexplicable phenomena."

"I'll review the rest of the staff," mused the general. "Did she recover her memory? Does she know what happened?"

"I didn't tell her."

Both men were silent. Ravenshaw was depressed. How fouled up can you get—all that advanced loot lost—Nell sore as a bee-stung goat—and incidentally he had killed a man twenty-two years before and never knew it until today. He shook his head.

"Black box, hah!" said the general. "Higher authority took it out of my hands. Quick work. It drove fourteen scientists right up the wall before they busted it, I don't know how." He smiled with some satisfaction. "Ravenshaw, I think you've done exactly right. Be my guest tonight. It's gin-and-tonic season."

Ravenshaw had landed at Andrews in a late spring snowstorm. He leaned back in his chair. He noticed his ka was sitting on his shoulder, wings furled, smoking a large cigar. "And after that, sir?"

"Well, we got one look at the wild blue and yonder country, didn't we? Carry on, Ravenshaw." ■

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WRONG RABBIT

One comforting thing about Space and Distance concepts is that they keep things so nicely separated. Now with a really good transport system—the separation could change to confusion . . .

JACK WODHAMS

Illustrated by Vincent diFate

PARIS: The controller relaxed in her cradle, let her mind empty of all memory and extraneous consideration. She stared into the vacant switch tube, soaking in her surroundings, permitting only immediate sensation to occupy her mind. She thought not of future or past, but only of *now*, of *being*, of being *aware*, of being alive now in this one vital place, being alive now at this one vital moment.

And it was time. The sender on Outstation C.W. BWICI was ready.

The receiving controller gently eased on the booster. The tiny emissions from her brain were taken, flash emulated, amplified, magnified ten-, hundred-, thousandfold. And her sense of being expanded enormously, swelled, while yet everything remained in proportion. She *was*—oh, so exquisitely and overwhelmingly she *was*, her consciousness of simply being all-embracing, of *here*, of *now*, heightened so powerfully as to be all of existence, this place, this time, existence, the only existence that there was.

Intense and reaching, brushing, looking, seeking, finding and grasping, another, two meeting to merge, knowing the same, the same walls and configuration and temperature and cradle and sharp burning green "one" against darkness. But in the sender's cone stood a young man, and the receiving controller saw him, didn't see him, saw him again, tried to lock on to him, absorb his detail, hold him, make him real. And the receiver had him, and the sender was already cutting back, releasing, when the green "one" seemed to flicker, become a green

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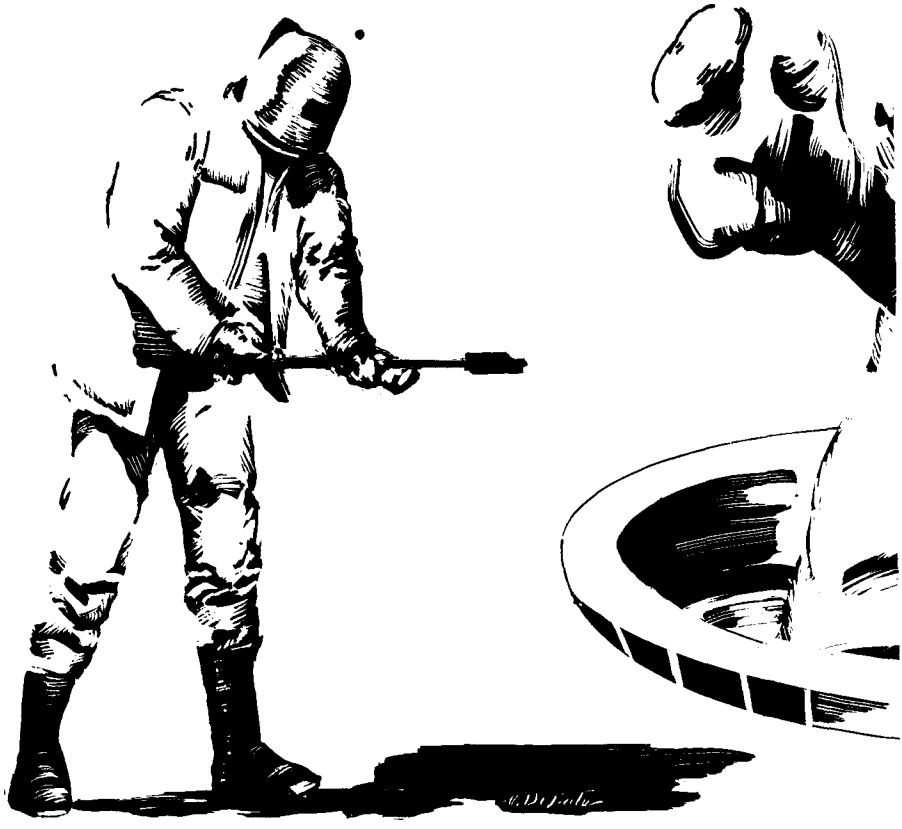
web. And the receiver's eyes widened and for a fraction searched a strange scene. And she saw . . .

The receiver screamed. "Aaaaaaaaaaah!"

TIGeeEeeg: The transceptor soggled into his swap chamber in unbelief. He sprikled in his comfcage. What he saw made him go wimply to his very skoojes. And it was making a noise! Such a thing could not be!

Weakly at first, but with rapidly



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increasing fervor, the transceptor began to waggle and blatantly scrawkle for redemption.

PARIS: Daring associates ran into the switch tube and grabbed the dazed and stricken controller, lugged her from her cradle and, spending more time gazing fearfully backwards than in looking where they were going, bustled her awkwardly to the exit and out, to permit the swift slamming and locking of the door.

It was a brave action, a rescue that took great courage.

TIGeeEeeg: They gazed through the spot holes in fascinated horror. "Whatever can it be?" Rakt asked, awed.

"Don't ask me," Vok answered in muted wonder. "I've seen a few weird things in my time but . . . nothing as purely inconceivable as a thing like that. And . . . And it *is* alive."

"Gu aahk, gu aahk," Rakt rustled faintly, "it's . . . it's so grotesque, I . . . I feel sick."

Vok felt queasy also "It . . . It can't get out, can it? We've sealed the exit I mean, if it should escape. . . ."

"Don't!" Rakt pleaded. "Don't even consider such a possibility!"

Vok quite literally fretted. "I shall be glad when the preservers get here. What can be keeping them so long? They're never where they're most needed . . ."

PARIS: Across the galaxy at Intersol's European HQ (The Intersol Psicle—The Safe, Sure, Superspeed and Only Way To Psi) human beings were responding in a somewhat similar manner to an uncalculated event that had occurred to *them*. They, too, were more than a little consternated.

Lionel Thanwick, recently appointed Transit Manager of Intersol, Inc. (Europe), with some trepidation eyed the steel-helmeted troopers who were setting up a RIP-blaster aligned onto the door of letter "G" switch tube. Behind them a knot of gendarmes in riot attire comported themselves with great sobriety and fingered their gas-jetters and stun-batons with ostentatious nonchalance.

Boylen Gultz turned away from the viewing-slot grimacing with distaste. "Ugh." He wiped his hands on his raincoat. "Ugly looking beast. Have you any idea where it came from?"

"None." Thanwick was vexed. How should he know? "It . . . just appeared."

"I see. But you *were* expecting a normal human passenger, right?"

"Yes."

"But he did not arrive?"

"No." What pointless questions these detectives asked.

"Did the passenger leave his embarkation point?"

"Apparently there has been some upset at that end also," Thanwick said, "but our communications sec-

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tion has advised us that he *did* leave."

"Could he have gone somewhere else? To another station maybe?"

"We've thought of that, but so far we've had no notification of a stray arriving elsewhere." Thanwick shook his head. "No, he's gone."

"Hm-m-m." Boylen took another squint at It. "And how is the receiver? Is she still delirious?"

"She's under sedation," Thanwick said. "They are very highly sensitive people you know, and a thing like this, of course, comes as a very great shock. I think it will be some while before Mademoiselle Boinette will be able to assist us with a coherent account of what transpired . . ."

TIGeeEeeg: Vok Rukukukak was vastly disturbed. "All he keeps saying over and over is 'No'. And he's got the twitches." The Co-ordinator of the Coswide Dispatching (Uuuslikct) Consortium, (The C.D.C.—YOUR Psimultaneous Travel Service) clacked in irritation. "Transceptors are so infernally touchy."

Rakt Kokikutkik, Inquisitor of Interchange Irregularities, said, "Can you get no intelligent response from him at all?"

"He saw it, couldn't believe it, and it became real and arrived. So much we can get from his backlin. The fact that he managed to materialize his gruesome visualization has astonished him mightily. It is, I suppose," Vok grumbled, a few hours sufficing to abate his amaze somewhat to permit consideration of other aspects, "understandable. But it is a nuisance that impedes inquiry."

"Do you think that this . . . creature could be the product of his imagination, that somehow, from his subconscious perhaps, he has inadvertently projected a devil-image culled from some dark inner recess of his mind?"

"Who could imagine a thing like that?" Vok derided. "True, when examined closely it seems that it might be composed in part of recognizable features of a number of disparate organisms, but as a conglomerate entity—no. And transceptors just cannot create such things out of thin air."

"That's just it," Rakt said. "The customer due is missing. Where did he go? Is it likely that he'd vanish without trace? That a monster should appear out of nowhere? Isn't it more probable that this . . . *thing* is the customer metamorphosed?"

Vok shifted his bulk to skirt one of the spikes of the inactive but potently posed ring. He gazed again through the spot hole. "No," he said. "Whatever it is, it's alive. Which means that it must have a metabolism and inner constitution capable of catering to its assorted pieces. And no one *could* imagine what plainly must be a very complicated combination of workings."

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"But, if it's just an outward manifestation, a product of the imaging capacity . . ."

"It's not a ghost," Vok said. "It is as real as you or I." He rattled a little. "No, I think what we may come to be forced to accept is that there has been a substitution. And that would mean . . ."

PARIS: "It could be only a baby one," the Secretaire to the President of the Republique declared with frosty belligerence, "or it could in a moment divide, perhaps break and spread millions of spores upon the surface of our Earth. It is dangerous. It should be destroyed immediately. It should have been destroyed the moment it appeared."

"We do not know what it is," Boylen Gultz answered calmly. "So far it has displayed not the least aggressive tendency. On the contrary, it appears to be remarkably timid. When we tried to approach, it kept backing away as far as it could go. It seems to have no weapons, apart from the frightful row it can kick up."

"A ruse, a trick," the Secretaire snorted. "It is an abomination, an obvious grotesque of Nature. It should be eradicated, expunged. It is a vile misshapen eyesore, an unknown quantity that constitutes a threat, not only to this country but to the entire world. We cannot afford to take the risk. An error has been made. That error should be corrected without delay."

Boylen stood his ground. "That creature, whatever it is, is not, I should say, feeling disposed towards conquest."

"Ah, you have become an authority on this monstrosity in a few hours, have you, *Mr.* Gultz?" the Secretaire sneered. "And pray, upon what facts do you base your diagnosis?" His face hardened. "I think your dilatoriness is inexcusable. You should have taken action at once, on sight. If you want to examine the thing, examine it dead, safe and dead!"

"Such action would be unnecessarily precipitate and unpardonable," Boylen countered, now with some sharpness. "That thing in there is more frightened of us than we are of it."

"Oh, yes? And what evidence has it given to persuade you to arrive at such a conclusion? You have spoken with it, have you? You can tell from your wide experience in such matters, you think?"

Boylen kept his temper. "I am acquainted with manifestations of fear. The behavior of this creature strongly supports the contention that it is scared out of its wits. It retreated; it made noises that might readily be interpreted as voicings of alarm; it made no effort to attack and, vividly sensing its distress, I made no attempt to close with it and thus perhaps provoke it into desperate retaliatory action, which would have obliged us to use unfair force."

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"Unfair? Your interpretation? Really, Mr. Gultz, are we expected to rely upon the caprice of your instinct?" The Secretaire became angry. "If you met that thing outside, up a dark alley, you would kill it instantly, without hesitation. You would at once recognize it as the embodiment of all that is repulsive. You can admit that? Why, then, should your attitude be any different here?"

"Because here the circumstances are different. *Here* is not up a dark alley. *Here* is a transceiver station of Intersol, which itself operates successfully upon a little-understood principle that is akin to instinct. And *my* instinct tells me that this creature is not inclined towards assertiveness and domination. Hasty panic action is uncalled for."

The Secretaire bridled. "It is not panic but plain commonsense." He pointed. "That thing in there could potentially represent the most serious menace ever to confront mankind."

"And it might not," Boylen replied with resolution and finality. "This is international territory and I am the accredited Intersol troubleshooter. The responsibility is mine, and if you wish to override my decision you will first have to take the matter to the Arbitration Council. In the meantime, the whatever-it-is is safely contained in the switch tube and will, I fancy, remain there, and consequently continue to be harmless . . ."

TIGeeEeeg: "A most obnoxious conception," Vok Rukukukak said, viewing, "and yet, after a while, it draws, has a configuration and composition that is morbidly intriguing."

"Do you think that that is where its power might lie?" Rakt Kokikutkik asked worriedly. "Do you think perhaps that it has an eminative power that subdues by exhausting a mind, that drives a mind to pursue an explicit answer for what, in effect, is a total improbability?"

Vok rasped gratingly. "No. You're resurrecting prehistoric superstitition," he scoffed. "It is a most weird and malformed animal, but the more I see of it the less I feel revulsion. We can assume that it is some form of intelligent life and Rakt, I ask you, can you not feel a measure of sympathy for a creature so abnormally housed?"

"I don't like it," Rakt averred. "I think that it should be disposed of. There is something evil about it. Such a design could never have the blessing of our Fabling Daagiirr. The evocation of pity could itself be a trap to beguile our sensibilities."

"No." Vok stared. "It performed the strangest evasive motions to the tentative overtures of the guardians. Its ululations were quite eerie —and yet I cannot help thinking that its intentions are not hostile."

"You cannot know that," Rakt warned. "Its spontaneous arrival could presage any number of fell

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schemes aimed to the detriment of our well-being. It would be most unwise for us to relax our vigil by one skidge until we discover the reason why it chose to come here."

"Yes," Vok said, "but suppose it is not here by choice? Suppose it is here by accident? Suppose that it was in some perilous position and its mind was screaming for help, and our transceptor—you know how emotional and high-slung they are—suppose he intercepted that cry, unconsciously, and was for a fleeting moment aware? What more natural than in his compassion to answer in a tinkling? And what more natural than that he should go into trauma at the sight of the bizarre creature that he had rescued?"

"Chuh-chuh. The accident notion does not appeal to me very much, I'm afraid. You are forgetting that your consignee has completely vanished. Where did *he* go? This *thing* has replaced him." Rakt was ominously troubled. "He could have been taken for examination, taken prisoner to be tortured perhaps—dissected perhaps. This thing could be a test sample that augers the advent of others, armed, warlike, deadly."

A messenger hurried up to Vok, gave him a scrobe slip.

"I don't think so," Vok said. "It would be a very unreliable and chancy method of infiltration. It's a freak occurrence, I'd say. It's never happened before."

The messenger took the opportunity to peek with delicious fluttering curiosity at the horror in the swap chamber.

Vok tickered the missive. "Drug-drug. Coooog. Well," and his harmonics took on a decidedly baffled rhythm, "it has now. Another one has arrived at Iliyeeeeehut . . ."

PARIS: "It's an invasion," the Secretaire asserted. "that much should be apparent even to a child. They've broken into our transit lanes and are supplanting human traffic with their own kind. And for what purpose if not to overcome us in some manner?"

The harassed Lionel Thanwick was at a loss. "I don't know what to make of it, I'm sure. In all our experience, in all the developing . . . We've had nothing like this happen before."

Boylen shrewdly assessed. "This other one in Vancouver—it is similar to the one we have here?"

"Yes, exactly," Thanwick said. "Some differences, but the general appearance has unmistakable kinship."

"You see," the Secretaire said, as though this proved something, "this is just a beginning. They'll start coming in everywhere, mark my words, both here and on our Outstations."

"After all our years of painstaking research, the laborious years of vehicular Outtravel, the pioneering . . ." Thanwick shook his head.

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"It's just not right." He could foresee his own and the life's work of others being brought as to nothing.

Boylen confirmed his disconsolate speculations. "If the Intersol system ceases to operate, then their opportunity to substitute disappears."

"What?" The Secretaire was startled by this. "We can't do that. The Intersol transport system is . . . is vital. You just can't cut off the colonies like that. It is a cosmic network of transcendental importance. It is matchless and priceless. Closing it down just cannot be countenanced."

"Just temporarily," Boylen said, "for a day or two. To buy time to go into the affair more thoroughly."

"Not even for a day or two," the Secretaire stated flatly. "The movement of goods and personnel is essential to the economies of our worlds, to our prestige. Those Outside rely upon the service, the link of direct facility to markets, to home, to medicine. How will they feel if they become deprived? No, the service must continue."

Exasperated, Boylen said, "But what about these creatures coming in? What if they keep on arriving?"

"Do as I suggested in the first place," the Secretaire said peremptorily. "Any time one turns up, wipe it out. When they find that they're getting nowhere they'll soon leave us alone."

"Oh, yes," Boylen was sarcastic, "and what about our people who get taken in exchange? How might it affect the travel business when it gets out that tourists and emigrants stand a good chance of being spirited instantaneously into," and he jerked his thumb, "Thingland?"

"We do not know that that is where they go," the Secretaire argued.

"No, but the odds would favor it, wouldn't you say?"

"Not necessarily." But the Secretaire's conviction weakened.

"And another thing," Boylen said, "it could be a genuine fault, purely unintentional. If we kill off the ones that arrive here, they'd like as not kill off ours that arrived *there.*"

"They probably have anyway," the Secretaire pronounced.

"Yes, but if they haven't," Boylen said succinctly, "don't you think it might be smarter to hold a couple of hostages? The one here is offering no resistance, and it would pay us, I think, to take time out to investigate in greater depth . . ."

TIGeeEeeg: "The Consortium, of course, opposes my judication," Voc said, "but under the circumstances I feel that wisdom dictates that we suspend dispatching services. We need to assemble and appraise what facts we have without being further discommoded by the advent of additional, grik, unwanted variants."

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Rakt made a few jutters of anxiety. "The Promotion to ReSettlement Conventers, and the Bartergroup Suppliers, will not be very pleased about that."

"Then they'll have to be displeased," Vok answered shortly. "We need time to spend upon thought and upon conjecture. Revenue is not everything. To blithely carry on as we are doing, just as though nothing has happened, would inevitably lead to chaos. Our communications system being what it is, concealment is difficult, and already the disquieting word has spread among the operators. From the number of notifications coming in, our percentage of aborts has already risen considerably. And we stand to lose the services of any of our valuable transceptors who become involved —for an indeterminate period that could, through prohibitive blockage, prove permanent. Such things in turn would tend to lower the very delicate esprit of the entire sending elite, rendering them perhaps more vulnerable than ever to overpowering."

"But with no dispatching facility . . ." The thought dismayed Rakt. "You will not be able to suspend it for very long."

"We cannot permit Dispatching to be tainted by apprehension. Far too much has been invested. I expect pressure," Vok said, "but it should not be too severe for a while. If the creature behaves itself and doesn't suddenly become obstreperous, the experts may be able to deduce something from its characteristics."

"More experts?" Rakt was doubtful. "The Ruling OrderOnes have done little so far except make contradictory statements. They've been no help to *me*," he complained. "They want the problem solved, and quickly, but they offer no constructive assistance whatsoever."

"Yes, kill or cure. It's the usual way. They don't care how it is done just so long as everything gets conveniently settled and back to normal. Well this time I shall not be surprised if they become required to endorse some uncongenial ratifications. But the experts *I* have called are a sonicologist and a petenarian. Both to my knowledge are professionally fanatic persons capable of that selfishly keen objectivity that ignores the finer susceptibilities to which most of us are prone. I am hoping that between them they might establish some form of communication with the—whatever-it-is . . ."

PARIS: "We cannot revert to old-fashioned fourth-class transport for everything, and certainly not for people," the Secretaire said. "It is far too slow and tedious and people just would not tolerate it now. Weeks of vacant and not altogether one hundred percent guaranteed hazard-free travel. No. Plus the fact

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that manned ships with suitable accommondation are comparatively few and are mostly owned by private persons or companies.

"Intersol has deliberately built this dependence," he accused, "and, therefore, it is up to Intersol to ensure that its utility remains unimpaired. I would emphasize that Intersol has global commitments and obligations, and I have no need to remind you of the binding clauses that subject the organization to international review and revision if its performance is less than satisfactory. And its handling of this present sitation *is* less than satisfactory. If this matter is not soon corrected to enable resumption of uninterrupted commerce and travel in the interests of this country, we shall feel impelled to exercise our prerogative and have the present management put under scrutiny for suspected negligence. Is that understood?"

"I understand," Thanwick said wearily. "We are doing the best we can. The controller is said to have recovered her lucidity. Mr. Gultz is hopeful now that she may be of some help to us . . ."

TIGeeEeeg: "You say," Vok said, "that the image of this thing interposed and blotted out the image that you had tuned to receive?"

"Yes." the transceptor agreed, his scraping still nervous. "Suddenly it was there. And I could do nothing. I was helpless, paralyzed. Never had I envisaged such a ghastly creature. It was awful. I was petrified. Senior, I cannot describe to you the feeling of kooig that permeated my slaktuc. Out of nowhere, completely unexpected. I was simply terrified."

"And you brought it in," Vok said heavily.

"That was the most horrifying part of all," the transceptor said. "That I brought it into existence, that it became real."

"Yes." Vok shuffled some of his members. "What about the swap chamber? Was it in a swap chamber like ours? It must have been, mustn't ti? A copy. And if it were a copy, that would rule out coincidence."

"No. No, I don't think so," the transceptor said. "It wasn't the same. Similar in some ways, yes, but my impression was that the background and frame bars were distinctly alien, peculiar."

"Gu. Well at least you didn't pick it off some yunk tree. Can you remember some of the particulars of the differences?"

"I've tried, Senior, but the creature itself was so compellingly repugnant that I had no thought to take note of other features. It happened so quickly. My only clear recollection is of the frame bars. Our spray pattern seemed to be replaced for an instant by what seemed to be a single bright vertical. It was there only a moment. And then, it was here."

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"Yes. Yes, well don't you worry." Vok made his tones as melodiously reassuring as he could. "It was not your fault, we are aware of that. It was a mishap that could have happened to anybody. And, with the grand help you have given us, we hope, very shortly, to be able to rectify the matter . . ."

PARIS: "Take another look at it," Boylen invited.

Thanwick complied. He could gaze now upon the creature with some dispassion. It conveyed a measure of the forlorn in its inactivity. Over the past hours much of the fearsomeness imparted by its very novelty had faded. Thanwick had come to regard it more as a prime nuisance than as a possible danger.

"Look at its dress, those plates, those fancy-colored little shield things," Boylen said. "And that silvery-gray is not its skin, either."

"So?" Thanwick said, a trifle testily. "We can guess all that. It's an intelligent creature from somewhere, a semi-exoskeletal species that has the decency to wear clothes. Does that help us at all?"

"It's carrying those things like overgrown pea pods. Now the one in Vancouver is dressed and colored differently, has disk-like luggage, and more of it. The female of the species."

"Luggage?"

"Luggage. They're tourists, of course. Don't they look like tourists? Or emigrants. Just like the two *we* lost. From what the controller told us, it's plain that Intersol and a like alien organization have accidentally broken into each other's transit lanes."

"What? But how? Our controllers have no such conceptions. They couldn't make contact blindly just like that."

"But they did. Intersol has been running for some time and has perhaps reached that stage of confidence where, here and there, there might be the slightest easing of concentration. There is need to shun distraction but, after a time, even the best controller might be excused if an unscheduled flutter, a coincidence in color say, attracts his attetion and he momentarily scans his periphery to identify the intrustion."

"Having found an intruder, that's no reason why she should have locked onto it and brought it into *our* circuit," Thanwick said aggrievedly.

"But she couldn't help it. If you were an expert routinely used to going somewhere, your training specific to match target could give way one day and you could turn your head to look at an unusual motion caught in the corner of your eye. And there, pacing you just behind your shoulder, you would see a monster. From that moment you would think of little else."

"Ah." Thanwick gave it some thought. "You have a point. But

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actually the monster is harmless? It has always been there? Well, that's a fine thing. How can we prevent our controllers from looking?"

"By getting them accustomed to the animal. It is the unfamiliarity that is frightening. Make vids of the things and get every controller thoroughly acquainted with its appearance. Hannibal scared hell out of the Romans with his elephants simply because the Romans had never seen elephants before. And Pizarro had a similar trick in using horses against the Incas. Even people afraid of reptiles and spiders can develop an immunity to panic by taking the trouble to glean some intimate knowledge of that which they fear."

Thanwick nodded. "Yes, you may be right. From what we've seen of it, it's not at all vicious. Yes," he added, "that will be worth working on. Combined with subliminal suggestion and veiled implications as to the creature's basic inferiority . . ."

TIGeeEeeg: "It appears to be languishing," Vok said, "and I'm not happy about it. Think, Rakt, how *you* would feel if you were in one of *their* swap chambers, surrounded by them, having them sawking at you all day."

"Don't!" Rakt begged. "I'd go out of my mind."

"Precisely," Vok said. "You can comprehend then how this creature must feel here. I can only hope that our two have been as unconsciously wise as to be stupefied into inertia. What this one feels, so ours must be feeling, and you will agree that relieving their condition, if they are still alive, should have the simple priority of mercy."

"De, certainly," Rakt said, "certainly. Such a circumstance I would not wish to befall my most importuning creditor."

"Quite so. Thus must we understand and sympathize with the creatures. They are, after all, our prisoners, aren't they? Latent bargaining material. And dead bargaining material will deteriorate markedly in value. I think we should treat them as guests and endeavor to make their stay here more pleasant than it has been."

"What do you propose?"

"Well, as you know, there was nothing in their portage that in any way suggested militaristic ambition. True their accouterments are ingeniously contrived but, with such odd creatures, this is only to be expected. Unless in some obscure way we have misconstrued the analyses of their various items, they are certainly not equipped to initiate even the most rudimentary of offensives."

"On the face of it, it does seem that they are innocent enough," Rakt admitted, "but can we be sure? They could be part of some devilishly cunning plan that is beyond our cognizance."

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"I think no," Vok said, "and anyway it will be to our advantage to keep them in good health. Kindness might benefit us to find favor in the eyes of our diabolical conquerors, if such they prove. On the other glatsic, if they are as innocent even as our own, then we cannot do less than treat them with the charity that we ordinarily bestow upon the regarded unfortunate."

"You, keee, are not thinking of letting them out?"

"Under supervision, of course. Zook knows what they eat, or how often, and I very much fear that they may starve to death. The petenarian Klit is experimenting with various foodstuffs, but so far it has taken only a little water."

"Klit seems rather too enthusiastic for my liking," Rakt said.

"Ak, I don't know." Vok stroked meditative overtones from his resonancer. "He makes some down-to-glutsluj suggestions. For a start these creatures as they are must be lonely if truly they are here by misadventure. So one of the first things we want to do is offer them the choice of each other's company, and see what happens . . ."

PARIS: "We are hopeful of a breakthrough soon," Thanwick told the Secretaire over the land-line, "and everything is under control. I assure you, sir, that permission to import the creature from Canada is much appreciated, and the strictest precautions *will* be taken. Of course they will not be allowed to run around loose. Sir, the greatest care and protection will be maintained at all times. Yes, we shall bear full responsibility. No, your proprietorial claim to the one is not disputed, and should it prove impossible to return it from whence it came, if and when it dies here the Academie will be notified. No, sir, not before. We have resort to many avenues yet before such a proposal could merit consideration."

Thanwick rubbed his baggy eyes, looked up to assure himself of Boylen's frowning support. "Those engaged at present might be thought to know best, sir. No, that was not meant to be deprecatory, sir. Yes, we *are* aware of the Usage and Prerequisite Rights of the Sovereign State of Location, sir, but *we* also have rights under that agreement. No, no, we in no wise intend the inference that we challenge your sovereign authority. We are very grateful indeed for the co-operation that you have given. No, at this stage we cannot undertake . . ."

TIGeeEeeg: "Our plan, in a skutsnil, is this," Vok said. "We must make a deliberate attempt to contact them. These four exemplar transceptors are to take it in turn to probe for a terminal that these creatures employ. Once contact is made, it is hoped that a description of their swap chamber will be obtained and thus aid us in fabricat-

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ing a duplicate here. This should help us to strengthen the contact and, once made, I feel sure that they will be as anxious to recover their own as we are to recover ours. And it is probable that, like us, they will wish to take steps to ensure that such mistakes are not repeated.

"We shall be operating this single terminal; therefore any contact made at all will be made with one of theirs, not one of ours. I have great faith in the exemplar transceptors, they have sterling resilience and fortitude, and they fully realize that the livelihood of their confreres may depend upon their unflinching efforts . . ."

PARIS: "Anything so far?"

"No," Boylen said touchily. "Give them a chance."

"What do we do if they make contact?" Thanwick inquired.

"Not *if* they make contact, but *when* they make contact," Boylen insisted. "These fellows are the best, aren't they? The master controllers from five continents? They'll make contact all right."

"But then what?"

"Well, Professor Bennet's team of cryptologists from the States have cracked the fundamentals of the sounds these things make, and they've put together a box of knocks and screeches which they say is a message of greeting professing amity and mutual regard. For an opener we'll send that."

"Hm-m-m." Thanwick was dubious. "The noises they make sound like rusty saws sawing rusty saws," he said. "One click too many could turn a compliment into an insult, and one 'eeeech' instead of an 'aaaark' and we could have a war on our hands."

"I wish you'd shut up," Boylen said, sleeplessness beginning to tell. "It's bad enough as it is. Anyway, by demonstration we managed to record a message from the creatures themselves."

"Oh? Do you know what they say in it?"

"Does it matter? We can't censor it, can we? Professor Bennet O.K.'d it from a loose interpretation, but who can say what shades of meaning, innuendo and slang they might convey when they scratch at that blister of theirs? We'd never catch their particular double entendre in a million years. We have to trust them and trust that the fact that they are still alive will speak eloquently of our good intentions."

"Yes, there is that," Thanwick conceded. "And they have been quite lucky that way, really . . ."

TIGeeEeeg: Contact! The exemplar transceptor strove to remark the discrepancies between his familiar swap chamber and that of the alien. With careful haste he committed the details to memory. The alien transfer pad, as was his own, was empty.

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PARIS: "How's the resemblance now?"

Yoku Hashamori, master controller, looked. "Yoy. That about it, maybe. Me try again."

TIGeeEeeg: "What are you talking about?" Vok demanded. "You couldn't have got one of our terminals because they've all been closed till further notice. You know that."

"It *looked* like one of our terminals," the exemplar transceptor said. "Funny, the superimposition looked similar to what it was first time."

"And you couldn't manage to send the vibotoner?"

"No." There was something there that *they* were trying to send to *us* . . ."

PARIS: Thanwick had come into his own. "What do they think they're playing at?"

"I tink, Misster Tanwick, they maybe do same us," Hashamori offered politely. "We make tube like them, so, they make tube like we."

"Oh. Oh, is that so? Well, why couldn't they leave it as it was? And you didn't send the autoblabber?"

"He have parcel on plate already for thisaway."

"Oh. Oh, had he? Trying to get in first, eh? We'll see about that. What do you say, Mr. Gultz?"

"Why not build an adjustable tube? Then you can key the hands to match alternates until they both coincide."

"Yes, naturally," Thanwick said. "The obvious thing to do. Where's that foreman?"

TIGeeEeeg: The orders came swiftly from the exemplar transceptor and Vok passed them on in rapid fire to his crew.

"Narrow the lucent apex slightly, constrict and elongate the focal —no, too much—too high now—fatten—intensify the lucent—lower the pad slightly, make it more oval—no, hold it—shade the focal more—no, no, No! that's the wrong way . . ."

PARIS: "We beat them to the changes 24 to 23," Thanwick said with relish.

TIGeeEeeg: "We beat them to the changes 24 to 23," Vok said with relish.

PARIS: "They should stand by and let *us* send first," Thanwick grumbled. With the positive call to his managerial talents, he had rebounded surprisingly, convinced once more that the intangibles of his trade, if inexplicable, nonetheless had that degree of rationality so necessary for workability. "You'd think they'd have the gumption to clear the plate after we've clearly indicated that we have something to put through."

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Boylen was glad for Thanwick's restored morale. He was relieved to see Thanwick taking charge and, like the good officer that he was, Boylen was ready to relinquish his mandate just as soon as it was no longer required. Boylen even began to permit thoughts of bed to enter his mind. "What's the odds?" he said. "If they have a package for us, why not collect it?"

"After all the trouble we've been put to, you'd think they'd have the common courtesy to grant us our priority."

"The protocol of precedence is not all that important, is it?"

"It's the principle of the thing."

"Well, it's a principle that's not doing your lost customers any good —if they're still alive," Boylen observed mildly.

"No." Thanwick was resentful. "No, I suppose not. It's just . . . Oh, we'll give them the plate . . ."

TIGeeEeeg: "I wish they'd make up their minds," Vok fumed. "First they want to send when we want to send, and then when we leave it open to receive, *they* want to receive. So we prepare to send, and they want to send when we want to we leave it open again, and now *they've* left it open again. They must be stark staring mad."'

"What are you going to do next?" Rakt asked.

"What would *you* do next?"

"I'd say . . . I'd say leave it open again."

"Guh. But if you knew that they also knew that it was logical for them this time to stay open, and they knew that *you* knew that it was logical for *you* to stay open this time, what would you do then?"

"I'd prepare to send."

"Gikkee. But if you knew that they knew that you knew that it was logical for you both to stay open and, therefore, that one should send, would you assume that the initiative was yours? Or theirs?"

"They'd think it was theirs."

"Keek. But if you knew that they knew that you knew that they thought that you'd think that the initiative should be yours, what would you do then?"

"Leave it open. No. No, wait . . . I'd send. No . . ."

"That's exactly how I feel," Vok said. "From now on it is all random . . ."

Eventually, after a few more tries, the first test intentional transportation of goods per Intersol-C. D.C. took place. It was an historic moment. Shortly the errant travelers were returned, in reasonably good condition, respectively to environments peopled by their kind.

But the association did not end there. From bothersome beginnings, it was inevitable that, disparate though the parties were, some accord be reached that such contretemps might more surely be avoided in the future. It was neces-

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sary to modify swap-tube design that the two types be made even less easy to confuse, and it was desirable that destination signaling focals be off-centered; one taking the right and the other the left. Indeed, there were myriad details that the two systems required to assess and compare each with the other, and the advisability of establishing an amicable liaison was a patent and obvious need.

The Paris-TIGeeEeeg link was kept open. Professor Bennet was one of the first specialists to be readily persuaded to volunteer to be sent to the C.D.C.H.Q., there to pursue language studies at firsthand while being retained as chief negotiator. He was able to handpick his staff from a number who offered, and he formed a formidable squad of interpreters of sound, including an extremely versatile animal imitator, an entomologist, and a man who could converse with dolphins and seals. Naturally a reciprocal delegation of semiexos—as they were classified in human tongue—was installed in Paris to conduct similar investigation into the skinnibit—the politest translation from their stridulations of *their* title for humans—way of life.

Resumption of their normal separate schedules did much to relax the governmental stress placed upon the two agencies, and discovered co-operation in one way prompted a sequence to cooperation in others. Curiosity has ever bidden the sentient forth to venture their sensing to strange sights, sounds and smells, to marvel particularly at weirdness controlled.

From their inauspicious first encounter, an atmosphere of harmony grew between the two species, a fact that greatly surprised them both—an inexplicable cordiality that neither cared to comment upon for fear of spoiling something.

So at first between them passed scholars, journalists, sociologists and such. Before long the flow increased to carry exchange traffic of greater professional diversity, engineers, doctors, business-types. Dissemination of knowledge, as it can, painted the lure of adventure in safety, and dawned a new era in tourism. The introduction of the lightweight one thousand phrase two-way chatterer more or less clinched the promise that the relationship offered.

PARIS: "We can go ahead with the campaign," Thanwick said contentedly. "The deal's been closed. Five units on each continent, more units to be added as needed; outshipment within the network, by the network. Cost balance assessment each twelve months; settlement by agreement. Promotion to be handled by the species, to the species, for the other species, to encourage trade and cultural interflow and exchange, with ten percent levy against the service that

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fails to provide at least seventy percent Main Transits of its kind as the other. Ha! We won't have to pay *that*."

Thanwick switched on the publicity reviewer burbler. He ran through "Golglobe, The Tourist's Paradise," "Aqualand, The Mariner's Mecca," "GreenGreen, Holiday Joyworld," and came to the openers devised after much thought by that excellent firm of Wink, Slyde and Scormor of New Madison Avenue.

Thanwick sighed. They had done a splendid job. Never had Thanwick seen a semiexo more unprepossessing. They had touched it up and highlighted it magnificently, had it superbly limned to exquisitely thrill. And the script was a masterpiece of succinct psychology: Visit Semiexo Country—The Lands Of The Gentle Monsters.

TIGeeEeeg: Vok was pleased. The treaty more than doubled the locations available on the itinery. True, three of the fourteen had rather too much oxygen to make more than a brief stay comfortable, but they included two of four company worlds and would anyway be of interest mainly to the short-stop buying-and-selling fraternity of the chemical and mining interests. The exchange of exploratory data might save some duplicate work and could possibly disclose a useful planet or two considered unsuitable by *them*.

Vok clittered in satisfaction. And the beauty of it was that the competition could never get out of hand. Flagrant breaches by either side could cause a disruption that could bring the whole of their joint services to a standstill. And neither side could bear the thought of that.

Vok activated his imager to delight himself again with the enticetric that the Promulgators Seeg, Vek and Kookikook had programmed to tittilate the itchy skoojes of their fellows. It was kimmigy, but good. From the borrowed representation of a skinnibit vid star named Legsly Brestwell, there had been conjured an in-depth illustration of the species portrayed at its wildest and most extreme contortion and development. A snap, crackling chorus went with the picture—roughly translated: Tour The Worlds of The Skinnibits—And See The Strange Homes Of The Friendly Creepies.

"Hideous," Vok told himself happily. "If that doesn't draw them, nothing will. And we won't have to pay the ten percent indemnity . . . " ■

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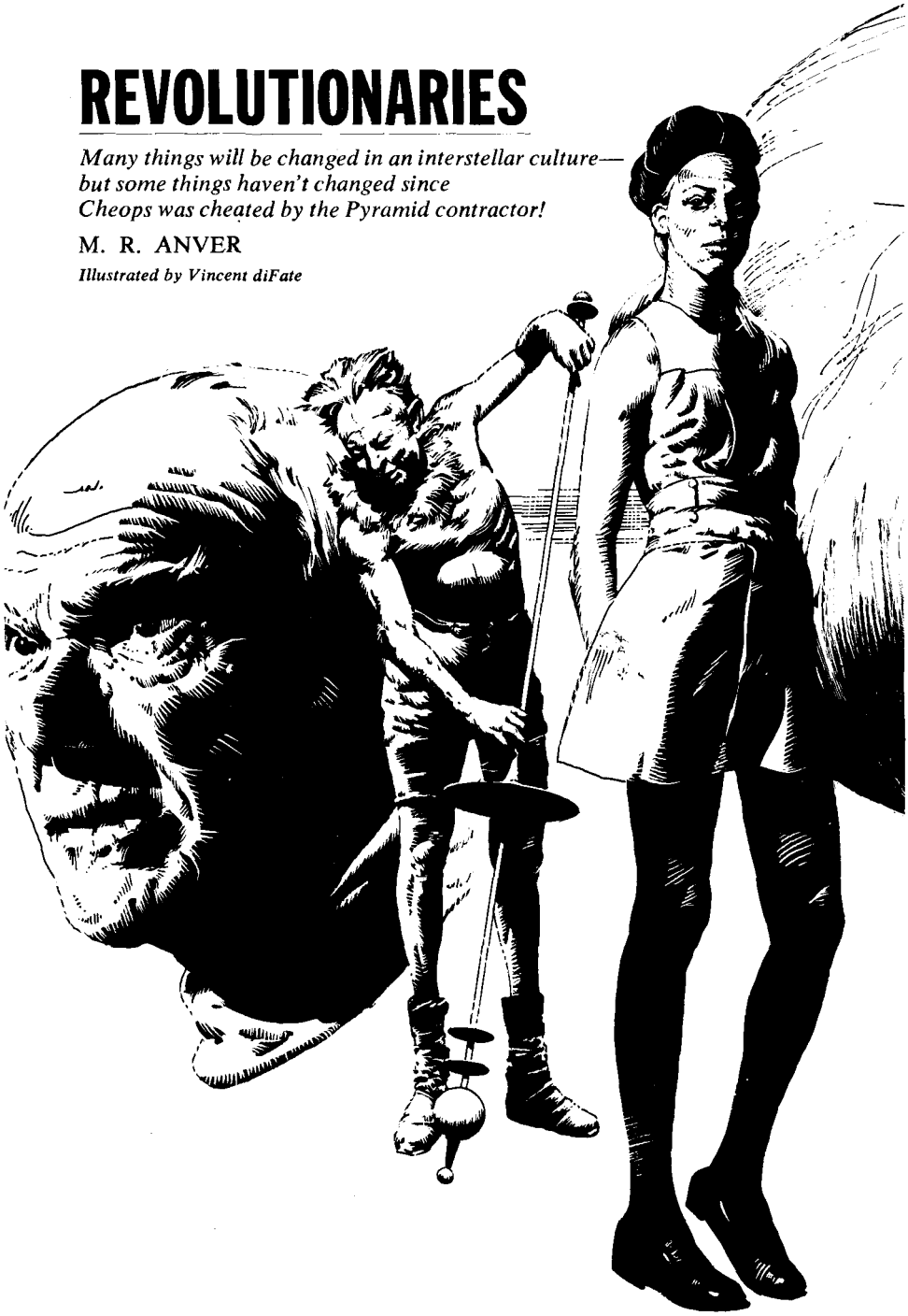
REVOLUTIONARIES

Many things will be changed in an interstellar culture—
but some things haven't changed since
Cheops was cheated by the Pyramid contractor!

M. R. ANVER

Illustrated by Vincent diFate



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People had been queuing up at the designated distribution site since early morning but for some inexplicable bureaucratic reason, the government trucks bringing new ration cards had never arrived. Now, with the red sun directly overhead, the crowd was hot, impatient, and, John Cameron thought as he neared them, thoroughly disgruntled. He stared at the mass of humanity and frowned, the downward slant of his dark blue eyes becoming even more pronounced. Ronan would have disapproved of United Party volunteers trying to work a highly volatile crowd of this size, Cameron believed, but Ronan, returning from the planet's only other large city two thousand kilometers from the capital, obviously was unaware of all campaign activities in his party's behalf.

Cameron ran a hand through his short, dark hair, matted in ringlets to his forehead by sweat, and blended unobtrusively into the crowd, letting himself be jostled and shoved in order to work his way around. He hoped to catch some glimpse of Ronan's people.

"I've been standing in line for five hours! You're not going to push ahead of me like that!" A stocky woman tugged at Cameron's elbow.

"Sorry. Just passing through."

"If you're not waiting, then you must be with the government," a man behind him snapped.

"No."

Someone else muttered, "I hear that the rationing's really going to be tight this time."

Cameron, listening to conversations around him, extricated himself from the immediate press of people.

"It's because of the spoiled grain."

"Somebody told me that was sabotage, not the plant disease the government talks about."

"That's crazy. Why should the Azureans kill off the grain? It's their food supply, too."

"Maybe they've got their own stored away. I've heard . . ."

Cameron turned his head abruptly, seeing a brief flash of vivid blue part way across the square. Leaving the speculators, though their ideas interested him, he threaded his way through the lines toward a young girl with eye-catching but natural blue hair. She wore a hat emblazoned with UNITED PARTY, two long plaits of hair beneath it falling down her back, and a short dress made in the design of a Ronan poster. She was attempting to pass out handbills, spending most of her time scrambling to pick up those discarded by uninterested people.

"Dreda, save your literature and your effort for a better time."

The girl looked up in surprise, then smiled. "Hullo, Cam. Is Ronan back?"

"He should be shortly. I came ahead. Did you hear what I said?"

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"Yes, but when could be better for campaigning than now, with only five days before the election?"

"When circumstances are less hostile."

"The people aren't hostile to us," she protested.

But they're not receptive, either. They've got other things on their minds." Cameron took her arm. "Come along. Where are the others?"

"Oh," she gestured vaguely—all over the square."

"How many are there?"

"Myself, Petrick, Acal, Jesse, and twenty others. But Cam, Jesse said that we couldn't pass up this concentration of people—"

"If you're involved in a riot, you'll cancel out any benefit from distributing a few handbills. Go on, find as many of the others as you can and meet me at the west entrance of the square."

ATTENTION! PLEASE.

The amplified voice blasted the square with sound. Cameron looked around, then up to locate its source, a government flitter hovering overhead.

THERE HAS BEEN A DELAY IN PROCESSING THE RATION CARDS, the disembodied voice shouted. THEY WILL BE ISSUED TOMORROW. PLEASE RETURN HOME.

The crowd's response was a garbled chorus of protest, jeers, obscenities.

CARDS WILL BE ISSUED TOMORROW, the speaker repeated. RETURN TO YOUR HOMES IMMEDIATELY.

The flitter rose up quickly and disappeared, but Cameron's gaze had shifted to a sound truck which suddenly appeared at one end of the square.

CITIZENS OF ACHATES, the truck blared, jerking the crowd's attention away from frustrated contemplation of empty sky. DO YOU KNOW WHAT CAUSED THIS DELAY? IT WAS AZUREAN SABOTAGE! THEY DAMAGED COMPUTERS, DESTROYED THREE TRUCKS—

Dreda, still standing next to Cameron, gasped indignantly. "That's a bunch of lies!"

THIS IS ONLY A SAMPLE OF WHAT WILL HAPPEN IF THE AZUREAN PAWN, RONAN AND HIS FOLLOWERS ARE ELECTED.

The truck provided an emotional target, Cameron realized, and the mass of people in the square turned to it, mingling cheers and derisive shouts. He braced himself to keep from being swept along. Holding Dreda's arm, he plowed through the crowd in the opposite direction, forcing an open path with shoulders, elbows, and knees. Dreda hung back like an anchor, engrossed in what was happening at the truck.

"Someone's got to stop them from spreading Manoc's lies," she

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protested. "Wait . . . Cam . . . look, there's Jess and a couple of others. They're trying to disconnect the speakers. Come on—"

FOLLOWERS LIKE THESE, the speaker accused. DISRUPTIVE, LAWLESS—

Cameron, without turning around, jerked her arm so violently that he nearly pulled her off her feet. The girl gave a cry of dismay, "Wait! I've dropped all my leaflets," but he continued moving, squeezing between red-faced men and a woman frantically trying to hold on to three small children.

"In the disturbance that's about to happen," he threw over his shoulder, "the best place to be is elsewhere. As I mentioned before."

"It's *her* kind that starts all the trouble," the woman screamed, and a gangling young man grabbed at Cameron's shirt.

"Where are you taking that half-breed?"

Cameron said affably, "Excuse me." He jammed an elbow into the boy's solar plexus, side-stepped him, and hurried forward. He now could see the entrance to the square and beyond it, three government troop carriers speeding on cushions of air up the street. Angling to his right, he reached an area of store fronts lining one side of the square. Two windows had already been broken, their glass scattered across the pavement. Stopping to let Dreda catch her breath, he finally risked a glance behind him.

The crowd had changed from any semblance of order into a seething jumble of fighting radiating from the sound truck's location. The truck itself was no longer visible, overturned or overrun with people. Cameron couldn't tell how many of them were actively battling, how many were simply caught in the hysteria brought on by food shortages, rumors, disgust with the current government, and the brutal planetary election campaign of the past two months. In any instance, blue-helmeted volunteer militia now pouring into the square wouldn't stop to inquire about motives.

Next to him, a subdued Dreda asked, "What will happen to Jesse and the others?"

Cameron, eyes fixed on the crowd, pulled Dreda to her knees, dodging a chunk of stone which whizzed over their heads and into a window behind them, spewing out a shower of glass. "We'll find out later," he said tersely. With Dreda following, obediently this time, he jogged past the shops, into the comparative quiet of city streets surrounding the square. "The crowd will be dispersing in all directions so if you don't want to get caught in a stampede, hurry up."

Dreda trotted along behind him, combing glass splinters out of her hair with her fingers. "Cam . . . were they fighting for us . . . or against us?"

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"I don't know." His blue eyes narrowed into triangles. "And possibly, neither do they."

"The Sporn solar system explored by Survey in 3180 G. Y.," the tape related as a star chart appeared on the screen. "Class M star, seven planets. Sporn III, now called Achates, suitable for colonization: oxygen/nitrogen atmosphere, gravity 1.5, equatorial diameter 11,530 kilometers." The chart was replaced by an orbital view of Achates, a predominately white globe, even beneath its cloud cover, broken by an irregular area of brownish green at the equator and occasional blue splotches of inland seas.

"Achates," the tape continued switching from data to philosophy, "is an example of universal brotherhood which is the foundation of the Federation. Due to the planet's climatic variation, it was colonized in 3195 by a human-Azurean expedition. Shown here are the colony's founders, Arne Ronan and Adan M'drona." A smiling, bald man stood with his arm linked in that of a humanoid whose luxuriant blue fur stood out around his neck and head like a ruff. "In a true spirit of cooperation, Achates' natural resources will be fully utilized —mining of the vital element, fjalarium in the cold, mountainous regions, agriculture and interplanetary trade in the temperate zone."

A series of pictures occurred in quick succession: a spaceport under construction, fields of ripening purple hybrid grain, buildings of an Azurean hamlet, the interior of a fjalarium mine, a colorful, biracial celebration—parades and dancing.

" 'We are such stuff as dreams are made on.' " Ivan Ronan stared at the blank viewing screen for several seconds after the tape ended, then ran a hand through his mane of silver-gray hair and raised an interrogative eyebrow at Cameron who had just come in. "Isn't that right?"

"Do you think so?"

Ronan sighed and stretched long legs in front of him, contemplating the hotel room, its furniture buried under a myriad of pamphlets and papers. "At this point, I really couldn't say. Sometimes I believe that by being Arne Ronan's nephew, I've been indoctrinated on the idea of a united planet since childhood. Thinking back on it, a form of indoctrination could have been done, you know, by taking complete psychological profiles of all colonists—human and Azurean —then screening them on the basis of attitude about coexistence as well as aptitude."

Cameron said, "I always thought it was done."

"No . . . not to any extent. It's hard enough to pry potential colonists from the comforts of 'civilized' Federation planets; culling a sizable percentage of those finally

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volunteering would have been impractical. The expedition would probably still be recruiting. I wonder, though, why the founders couldn't foresee the emotional problems that divided settlement created unless they were too involved in meditating on its wondrous technological wholeness. As things are now, Ronan's first theorem is being proved daily—xenophobia increases in direct proportion to the degree of separation. Fifty more years and we might, provided we survive, have a war for our centennial celebration." He grimaced. "My second theorem is that the tireder I get, the more pessimistic I am." He looked squarely at Cameron. Deep shadows beneath Ronan's eyes and a faint gray tinge to his complexion were testimony to the strain of his campaign for Prime Minister of Achates's unsteady government. "And that's enough philosophy for the moment. Sorry I kept you waiting, Cam. What is it?"

"The riots," Cameron said, coming to the subject although he enjoyed listening. "I've just had word that Jesse Colan and most of the volunteers—all but two—avoided arrest. The people in the sound truck also managed to disappear."

"Manoc's sound truck," a young Azurean interjected. Comfortable in a pair of brief shorts and his own coat of fur, he was sitting on a sofa in one corner of the room, scribbling on a long pad of paper. Though superficially different from humans, his race had evolved from analogous hominoid ancestors—and miscegenation occurring on Achates was the subject of some of Manoc's most violent tirades.

Cameron nodded. "But the people will be assembling again tomorrow, Ronan; I suggest you put out a printed directive forbidding any of your workers to mingle with those crowds unless you want a repeat of today."

"I'll do that."

"It's Manoc who's creating these incidents," the Azurean said sharply.

Cameron corrected, "He's using circumstances and you volunteers, Alif; the incidents naturally follow." He stared poker-faced at the Azurean whose blue fur rose along his back.

"Manoc's the one who's con-

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ducting a fear campaign with distortions about Ronan and my race, unfounded accusations—"

"Easy," Ronan said gently. "I hope you're not putting all that into my speech."

"No . . ." Alif riffled the pages of his pad, then looked up defiantly. "But I wish you'd *say* it just once. He certainly attacks you enough."

Ronan put his hands behind his head and slouched in his chair. "Oh . . . I take a dig or two at my opponent, but there's no point in deteriorating into his style. Anyway, demagoguery never was my specialty."

Alif smiled reluctantly. "Still—"

"There are two hours before we have to leave for the Azurean hamlets," Ronan interrupted him. "Let the speech go for a while. See about that directive for me if you will, then go down to the bar, have a drink and argue with your fellow volunteers."

Alif put down his paper and stretched. "All right. That sort of sounds good. I won't be long."

Ronan waved him out of the room and grinned at Cameron who sat, watchful but relaxed, on the edge of a contour chair. "Members of the United Party's ragtag, improbable coalition, as Manoc would say. We really are a mixed lot, though: some of us who were born off-world and came here as children and, regardless of species, the real Achatesians, first generation. I wonder if we can make it work. The colony's reached a turning point, Cam. We can either go on to be a viable Achates or remain human and Azurean, fragment apart, maybe never even reach a centennial. What a waste, were all this to end up as a statistic in some obscure Federation report on colonial failures. Manoc doesn't quite see it that way, of course."

"He does see this time as a turning point," Cameron said, choosing his words carefully.

"And he wants to determine the direction. Obviously. But in the end the colonists—by their votes or by their silence—will decide, not one man."

Cameron's first impulse was to drop his gaze; the very existence of such an impulse amazed him. Engaged in deception for so long, he believed it second nature to him, done to accomplish his job without consideration of side effects on other people. A millimetric flicker of his eyes was the only indication of his brief discomfiture. He remained silent, his face a polite, attentive mask, and watched Ronan who looked inward at some vision of his own, then shook himself.

"Cameron, troubleshooter extraordinary, I'll give you the same advice I gave Alif. Go get a drink." He stood up and accompanied Cameron to the door, one hand on his shoulder. "And if I haven't thanked you enough for your help, Cam, for materializing at the be-

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ginning of the campaign and being such an asset with your . . . professionalism is the only word that comes to mind, consider it done now."

Cameron wondered if Ronan were subtly trying to pry, then decided not. "My pleasure." He stepped away from Ronan's hand and into the hotel's carpeted hallway, dodging an oncoming group of volunteers, predominantly female.

"Cameron!" Dreda detached herself from the bunch and grabbed his arm. "Jesse and the rest are back. They're in 1003, getting first aid. We're going there—"

"I've got some business to attend to," Cameron demurred, giving one of her plaits of blue hair a gentle tug. "You get a full report."

"Say, Cameron." Jesse Colan, the chief object of the girls' concern, appeared around a corner of the hall, his black hair standing up in unruly tangles. "Is Ronan busy?"

"I believe he's resting."

"Oh." Jesse touched a makeshift bandage on his forehead gingerly. "I wanted to talk to him."

"Talk during the flight if you're coming."

"I am, but—"

"The girls are most interested in listening at the moment," Cameron added, pushing Dreda in his direction.

"You were surrounded by *hordes* of people," she said, taking his cue without realizing it. "How did you clear out before the troops came?"

The others chimed in, "What happened to Manoc's finks?" "Who hit you?" "Was anyone really hurt?"

Cameron skirted the admiring audience, his departure unnoticed as Jesse, with little reluctance, began his narrative. He walked briskly down the hall—the United Party's headquarters occupied the entire tenth floor of the only hotel in the capital—to an elevator. At least the colony's cities had some conveniences found on . . . civilized Federation worlds, he reflected during the rapid ascent to a flitter port on the roof.

Two flitter cabs were waiting. Pocketing his United Party button, Cameron slid into one and switched the controls to manual. For several minutes he flew a random pattern over the irregular patchwork of high-rise buildings and construction that was the capital, then, satisfied that he wasn't being followed, leveled the cab off into a fast, direct flight to the city's outskirts, setting the flitter down in a private landing area.

He was in a residential district with large houses spaced far apart and footpaths cutting across dry, light-brown grass. Some distance away, a child was playing with a mottled brindle lizard, an indigenous animal the size of a small dog; otherwise the area seemed devoid of people. With a final glance behind and above him—more from

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habit than anything else—he went to the closest house, an angular structure of glass and heavy native wood. The carved front door swung inward as he reached it, revealing a swarthy man dressed in civilian clothes but carrying himself with a martial bearing. He stepped aside to admit Cameron and said crisply, "Manoc's waiting for you."

"So you think the election will be close?" His black eyes as expressionless as two ebony beads, Manoc handed Cameron a glass of pale golden beer. A short, compact man with close-cropped red hair graying at the temples, he gave the impression of movement even when standing still. "Close even with the One Third Law?"

"Remains to be seen," Cameron said, tapping his glass for emphasis. "Ronan will almost definitely win his seat in the Assembly; whether he'll get a majority with him depends on the Azureans . . . and a sizable percentage of humans, of course."

"I doubt that he'll get a majority," Manoc said decisively. He paced across the spacious study and pivoted around. "But as a Federation observer, your judgment may be more accurate."

Cameron allowed himself a cynical half-smile. "It will be very close," he repeated. "I'll know more when we come back from the hamlet tour. However, a wise course would be to prepare for all contingencies."

Manoc looked at him blandly. "I have."

"Such as importing off-world mercenaries?" Over the rim of his glass, Cameron watched the other's reaction.

"How did you know that?" Manoc demanded.

Cameron gave a slight shrug. "My job is to observe for the Federation—"

"*Spy* for the Federation."

"As you wish. Patent observation would violate a planet's internal sovereignty. In any case, I do it and I do it well. Besides, mercenaries, when contrasted with Achates' amateur militia, aren't difficult to spot."

Manoc had recovered his aplomb. "Certainly not by one of their own."

"Yes." Cameron was unruffled. "Except . . . for assuring the Federation of the legitimacy of a colonial government, my price is considerably more."

"It's a price," Manoc said, draining his glass, "that Ivan Ronan wouldn't pay."

"That's why I only made my proposal to you when I arrived on Achates several months ago." Cameron spoke factually, his voice devoid of emotion. "For alteration of my report on the internal affairs of a Federation planet, remuneration runs much higher than my own salary."

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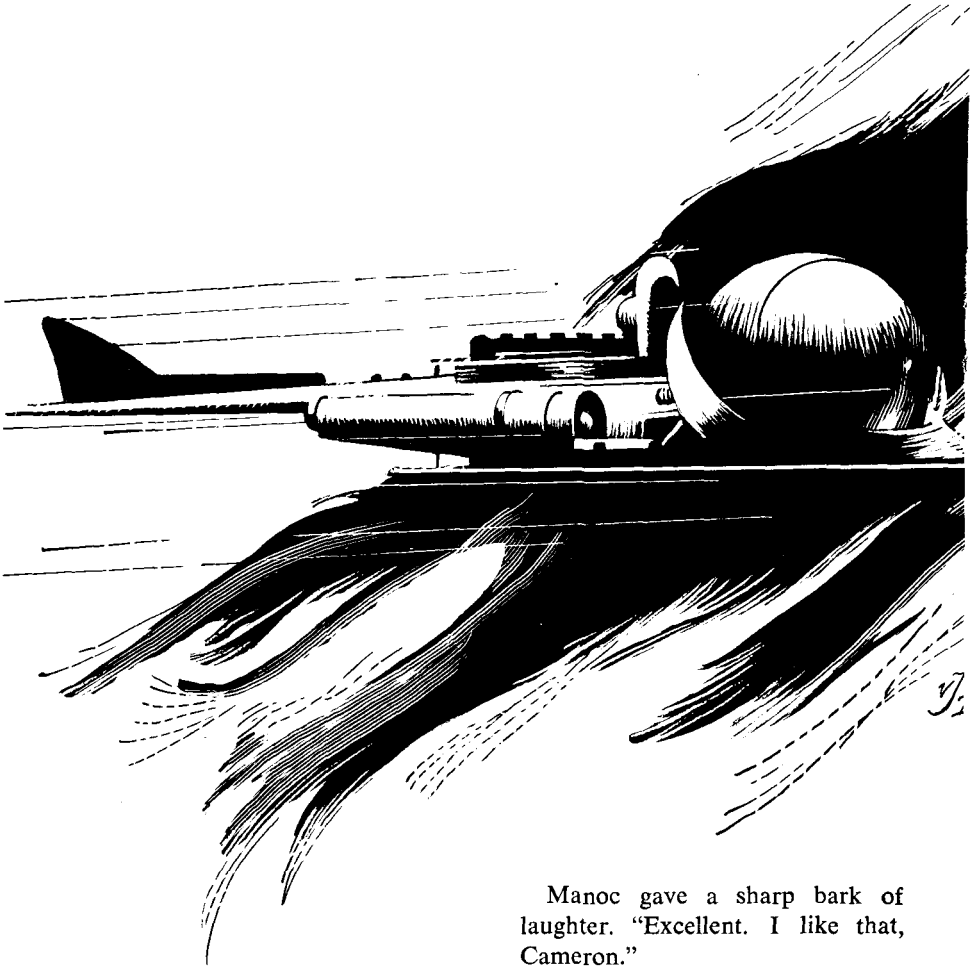

"And if I wasn't interested in altering the report—?"

"Illegitimate governments and intraplanetary warfare sometimes have the effect of a pebble thrown in a pond. The Federation wants to be sure that the government they'll give armed assistance to on request is representative. They pay me adequately to keep them informed. I'd send the facts as they are."

Manoc gave a sharp bark of laughter. "Excellent. I like that, Cameron."

Cameron doubted that Manoc did at all. "By the way," he added, his expression neutral, "I've warned Ronan off that ration-card crowd tomorrow. If the current Prime Minister has to impose martial law, the elections will be postponed and you probably can't afford the delay."

Manoc drummed his fingers on a desk in the center of the room. "Very astute. You're right about

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the time factor. As you've assumed, I've got alternate plans and I can't choose between them until after the election, though with the One Third Law, I was counting on the People's Party winning. It is the easier way to gain power."

Cameron glanced at his chronometer and rose. "Then perhaps you should concentrate on the harder."

"That damned One Third Law," Alif lamented. "It's going to *kill* us." His words dropped into the silence of the main lounge of the transport, a silence unbroken since Ronan had gone forward to his private compartment. Cameron, sitting on a couch between Alif and a fidgety Jesse Colan, turned away from contemplating the gray swirling nothingness of blowing ice outside. He could no longer see the Azurean hamlet they had left or any evidence of ground below.

"The majority of my people are complacent fools," Alif continued vitriolically. "Why don't they realize that they're not on Azure any more, that they have to adapt to *here?*"

One of three crestfallen staff members—all Azurean—sitting together in a corner of the lounge shook her head disconsolately, beads braided into her fur giving a ghostly rattle. "We tried everything an advance team's supposed to do," she said, "from talking to the mayor, to posting notices, to going to all the homes—"

"We couldn't drag them bodily out of their houses," another boy mumbled. They were still recovering from Ronan's acid comments about the size of the crowds. "They simply wouldn't come to the United Party rally."

Jesse nodded. "And they probably won't vote, either, even though most of their candidates are running unopposed." His words evoked a second interval of gloom.

The volunteers' despondency, Cameron knew, was a direct result of the One Third Law. Rammed through Achates' Assembly by Manoc's forces immediately before the government crisis and signed

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by the current, malleable Prime Minister, its main proviso was that districts with less than one third of the eligible population voting would lose representation in the unicameral legislature. This tended chiefly to affect the Azureans. Accustomed to government by a loose confederation of hamlet mayors—the closest human approximation of the title—they seemed bewildered, apathetic about a planetary election campaign. That is, Cameron thought wryly, if the reception—or lack of it—Ronan received in the four hamlets recently toured was any indication. He said aloud, "What about the next district, Alif? Will there be a difference?"

"You know my brother, Aref, is the candidate. I hope so!" Alif smoothed down his ruff of fur. "I haven't done any advance work because I've been speech-writing but if the turn-out isn't better, I'm afraid Ronan will throw me out of the transport while we're airborne. I've never seen him irritable like this, Cam."

"It's been a hard campaign. He's tired. If your people had extensive tri-V facilities or interest in using them, Ronan could have tried to convince them of the election's relevance from the capital."

"I wonder," Jesse said with a faint, jarring condescension, "if they *can* be convinced."

A soft chime interrupted the conversation. Cameron braced himself as the transport began to drop several thousand meters like a stone in preparation for a vertical landing. Disregarding the frantic messages sent by his inner ears, he watched the grayness of the weather, an unchanging vista suddenly broken by craggy peaks and a snow-covered valley rushing up to meet them. Dotting the valley like puffs of whipped snow were buildings of an Azurean hamlet, small dwellings radiating from taller centralized facilities like spokes of a wheel. Finally slowing its descent, the transport hovered to a landing on a pad within the central area. Cameron stood up, glanced at the window and back at Alif. "You'd better find an anti-grav pack," he advised.

Alif moaned at the sight of a mere handful of Azureans waiting outside, then brightened suddenly. "There's Aref and the mayor. Maybe everyone else is already in the auditorium." Brushing past Cameron, he joined the other staff members in a rush for coats. Cameron lingered in the lounge until Ronan, wearing a blue parka and a resigned expression, emerged from his compartment.

"Small audiences are more receptive," Ronan said with an ironic grin. Putting up the hood of his parka, he clambered down the ramp of the transport.

". . . And declare they are tools of fate, forced into acts by circumstances arising before they, as in-

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dividuals, had the capability to influence them. That claim is invalid on Achates. At this time, we have the opportunity to *create* circumstances. Our judgment . . . yours, mine, everyone's . . . will determine the future. Thank you very much."

The Azureans in the circular auditorium politely applauded Ronan's low-key speech. Cameron, sitting in the audience, glanced at the many empty seats; even an optimistic estimate, which his wasn't, would not have put the crowd at more than half-capacity. Nevertheless, he counted it as the largest nonhuman group assembled by Ronan and an Azurean candidate. He watched the candidate in question, Alif's energetic older brother, leave Ronan and the mayor talking together on stage and stride toward an exit leading to the lobby. Aref immediately picked up a tail of young Azureans dressed as he was in form-fitting clothing rather than the baggy, one-piece costumes of older individuals.

The rest of the Azureans followed sedately and Cameron, interested in comments they might make during the post-speech reception, stood up to join them.

The explosion in the lobby came without warning. A deafening crack of sound reverberated through the building followed by an even more deafening silence, then screams, crying, a babel of voices.

Cameron had ducked reflexively. Catlike, he came to his feet, his eyes sweeping over faces in the auditorium. Shock, horror, incomprehension—the tableau broke into a concerted rush for the lobby.

No clue—well disciplined, Cameron thought, pivoting in the opposite direction, vaulting over tiers of seats to intercept Ronan. Cutting in front of him, he slammed his shoulder into Ronan's midriff. The taller man sprawled backwards and caromed off the mayor behind him. Cameron regained his balance neatly, reaching over to help Ronan up.

Ronan attempted to jerk away from the tight grip on his arm. Partially doubled over, he gasped, "What . . . are you doing?"

"Stopping you. There might be another bomb."

"Bomb . . . ?"

"I imagine so."

"People may be hurt—"

"Yes. But wait. If there's a second bomb, it will probably be timed to explode shortly after the first, to catch curious onlookers before demolition personnel arrive."

Ronan straightened up painfully, his eyes fixed on the exit. "That's a damn cold-blooded analysis of a tragedy."

"Also a tragedy would be to scrape you off the walls." Cameron released his arm. "I think it's all right now." He stayed one pace in back of Ronan as the other ran into the lobby.

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The room was a shambles of milling people, pieces of a table, thousands of sparkling glass fragments, brownish liquid spattered on the floor, an undamaged tri-V crew off to one side, vulture-like, recording the entire scene. Ronan pushed through the densest concentration of Azureans, then froze. Alif looked up at him in mute appeal, cradling his brother's blood-matted head in his arms. Aref was unconscious, breathing stertorously. Beyond him, a woman stared incredulously at bright red blood spurting from the mangled stump of her arm while two men desperately improvised a torniquet. All other casualties seemed to have minor shrapnel cuts, Cameron appraised rapidly. He asked, "Has anyone sent for medical help?"

"I did." As if on cue, Jesse Colan squeezed through the crowd toward them. "I called for an aerohospital. They said they'd be here soon."

Cameron elevated his voice. "Who was out here when this happened?"

He received an indecipherable jumble of answers. Pointing to one girl, he led her a short distance away from the injured. "What were you doing?"

"I . . . was getting ready to serve refreshments. We don't have much because of the rationing but we prepared what we could." She plucked distractedly at her fur. "People were just coming from the auditorium, then the explosion—"

"Yes, I know. But before the speech ended, who was out here?"

"So many people . . . the refreshment committee . . . several that came with you . . . I didn't notice."

She was, Cameron knew, not far from hysteria; he doubted anyone else would be much more informative. He murmured, "Thank you," and moved her to one side while a six person aerohospital team entered the building and rushed past them. He saw Ronan lean down, touch Alif, then draw him back as two of the medics bent over Aref. Quickly, efficiently, they transferred Alif's brother to a stretcher while others attended to the woman and shepherded the walking wounded outside. In less than five minutes, medics and patients were gone, leaving only the residue of the disaster: debris of the reception intermingled with drying pools of blood on the floor. Uninjured Azureans, the mayor included, drifted aimlessly, dazedly around the lobby.

Cameron's mouth thinned, his eyes narrowing into triangular slits. With a conscious effort, he blocked off all personal reaction to the bombing. He walked over to Ronan who stood with an arm around Alif's shoulders.

"Sir, will you cancel stops at the rest of the hamlets?"

Alif stirred. "You shouldn't," he said thickly, "go on—"

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Ronan, face bleak, gave an almost imperceptible nod. "We'll continue the tour." The statement was flat, lifeless. He handed off the numbed Alif to Cameron as the tri-V crew advanced on him.

"Ronan, do you attribute this terror bombing to the opposition, or do you believe it to be the act of a deranged individual?"

"The motive and, hopefully, the party responsible will have to be determined by an investigation."

"But certainly you have an opinion."

Ronan shook his head listlessly.

"Ronan, do you consider the Azureans' apparent dearth of interest in the campaign indicative of how the election will turn out? Do you feel the majority of Azurean representation will be eliminated . . ."

". . . Especially after this latest incident?"

"I can't predict the outcome of the election. I am not prepared to pass judgment on the motives, or reactions, of other individuals. I do believe, however, that responsible Achatesians will decide the elections by the issues, not by intimidation, by half-truths, or by fear."

The tri-V review of the just-concluded hamlet tour switched to a shot of the transport with ice-coated buildings in the background and a swarm of Azureans greeting Ronan.

"Look at all those people," Dreda gloated. "I wish I could have been there."

". . . The whole population of that hamlet." "Capacity crowds for each speech." "Aref had a superficial head wound and a mild concussion," Alif explained animatedly to someone. "He's back campaigning. The woman's going to get a bioprosthesis—" "The tour was a complete success." "We're going to *win!*"

The volunteers' clamor of mutual congratulations drowned out the tri-V. One day before the election, a nervous ebulliency kept the United Party staff going at high speed, too tense to acknowledge overwork and lack of sleep. Cameron glanced around him at the laughing, talking people filling up the hotel suite, at four girls who had maneuvered to box him in on a sofa, one on each side of him and two sitting on the carpet, leaning against his knees. For a moment, an impulse to join the festivities tugged at him. Stop it, he rebuked himself. There's too much ahead . . . and it's not your celebration.

He touched the shoulders of the girls curled at his feet. "Excuse me, ladies."

"Cam, you just got back. Are you off already?"

"So it seems." He stood up. "You'll be more comfortable on the sofa."

"Oh, we were quite comfortable here," they assured him.

Cameron gave an absent smile,

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his mind not on flirting. He left the impromptu welcoming party and walked quickly to the room he shared with two other staff members, both of whom were busy elsewhere. Removing a shirt and discarded pair of shorts crumpled on a chair, he sat down by the visicom. After a brief hesitation—this was the only time he'd have before he set final events in motion—he punched a group of numbers.

The com screen revealed a blank, silvery patter. "Identify, please," a metallic female voice responded. "Name and purpose of call."

"John Cameron. A private matter." Actually, he knew the computer was interested in a voice print check, not his reason for calling. He waited impatiently until Manoc's face replaced the pattern.

"So you're back."

"Yes. Since I'm calling from United Party headquarters, make this brief."

"What if the call is monitored?"

"Ronan doesn't monitor calls."

Manoc snorted. "All right. I have a tri-V broadcast rally in the stadium in forty minutes. I'll send a private flitter, green, two-seater, to get you in five."

"Send along a militia uniform. Some of Ronan's people are sure to be waiting around the stadium since the United Party has a rally there in the late afternoon. I don't want to be recognized."

"You Federation people think of everything," Manoc sneered.

"That's right." Cameron terminated the call. He went into the bathroom for a glass of water to wash down stimulant tablets, then hurried outside and up to the roof for his trip to the stadium.

He found Manoc in a lounge beneath the domed stadium's seats. From the speed that the mercenary who had escorted him from the flitter disappeared, Cameron guessed that Manoc's mood, exacerbated by watching more coverage about Ronan on a wall tri-V screen, was as sour as his expression. He sat down without being asked. "Had you consulted me before I left on the hamlet tour, I would have advised against the bombing."

Manoc turned on him. "I don't need your hindsight, Cameron," he retorted.

"I would have advised against it," Cameron continued imperturbably, "for the obvious reason that it might—it *did*—arouse the Azureans, something Ronan and his activists couldn't do themselves, and because it could have led to a declaration of martial law."

"I told you—"

"Bombs have no eyes. What if your terrorist, whether an Azurean or one of Ronan's staff whom you own, had blown up Ronan? Were he killed before the election, there's no way I could falsify my report to give your take-over any semblance of legitimacy. You may not want

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hindsight but you should have foresight. If you lose the election . . . and it seems now that you will—"

"The *people* are with me. I don't need the Azureans or their mongrel half-breeds—"

"Don't count on it and don't give me campaign rhetoric."

Manoc glared at him, his face livid. "Don't push me, Cameron."

Cameron leaned forward. "If you lose the election, to justify a *coup d'etat* you've got to have something more concrete than vague claims of election fraud."

"You're extremely knowledgeable about my plans," Manoc grated.

"They're not exactly original," Cameron told him dryly. "But to fulfill my part of the bargain, I need specifics."

"Instances of voting irregularities, evidence that Ronan's forces planned armed revolt if they did not win, et cetera, will be very detailed. You'll have them when they're required."

"And what of the most critical factor—Ronan?"

"You seem so concerned about his welfare," Manoc said curtly, his anger still evident but controlled. "What do you recommend?"

"I'm concerned until the election results are in." Cameron kept all inflection from his voice. "Afterwards, I recommend that he be assassinated. Immediately."

Manoc nodded, unsurprised. "I thought of that . . . but it will make him a martyr to his followers."

"Later, yes. But initially, when their opposition could be crucial, they'll be disorganized, demoralized, something his arrest wouldn't do. You know the Federation's nonintervention policy for its colonies isn't as strict as for independent member worlds. They'll step in if actual violent revolution occurs. Assassination is the best preventative."

"If he's killed, what of your precious legitimacy then?"

"Not affected if the assassination is done skillfully and blame later attributed to one of Ronan's followers. That added to your other 'proof' will give your provisional government enough validity. And of course you'll pledge to remain in power only until . . . legal elections can be held." He stared at Ronan's image on the tri-V screen behind Manoc. "However, if you mismanage Ronan's elimination the way you did the bombing—"

Manoc slammed his hand down on the tri-V console, dissolving the picture. "What in hell are you trying to say?"

Cameron's words were light, unhurried. "A proposition for a very substantial increase in price. My primary role is that of an observer but at times, on various worlds, I've deviated from it. I can assassinate Ronan—and I won't bungle it." He slouched in his chair as Manoc

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stepped back, dark eyes probing Cameron's.

"Assassination for a profit?"

"Yes. More efficiently done than by a mercenary not in Ronan's confidence, or by one of your people blinded with hatred."

"Ah." Manoc folded his arms. "Then you don't hate Ronan."

"No."

"I believe you'd assassinate me," Manoc mused; "if someone else paid a higher price."

"I trust that's a rhetorical question." Cameron met Manoc's gaze unblinkingly until the other's eyes slid to a wall chronometer.

"*If* I lose," Manoc said finally, "I'll consider your offer."

He couldn't be persuaded further, Cameron realized. Tension suddenly gripped his head like an iron band, but he responded with an indifferent shrug. "I'll stay here until you start your speech." He watched Manoc leave the lounge, then turned the tri-V set back on, rose, and began to walk around restlessly.

Despite his assertions to Manoc, he was uncertain about the outcome of tomorrow's vote and obviously Manoc knew it . . . or did he? Manoc's confidence, his refusal to be prodded were disconcerting. His attitude could mean one of three things, Cameron thought, wondering fleetingly how much of his building case of nerves he could blame on the stimulants. With a mental shake, he considered all possibilities analytically.

One: Manoc hadn't decided yet what to do about Ronan. Doubtful. Manoc was seldom indecisive.

Two: Manoc, even if he eventually would accept the offer, wanted to keep his strategy secret. Possible. From everything he'd seen, Manoc made a fetish of secrecy.

Three: Manoc had already made his own assassination plans to use one of his men. Also possible and if so, extremely . . . inconvenient.

The tri-V emitted a raucous blat of sound which broke Cameron's concentration. Manoc had entered the stadium and ascended to the central platform decorated with a huge People's Party banner. He acknowledged applause and waving placards with uplifted arms, letting the crowd scream itself out before beginning his speech. Cameron listened carefully for anything new, then abandoned the effort halfway through. He had heard the impassioned oratory before, with its veiled allusions, bitter denunciations, vilification of the opposition . . . a tested and timeless technique.

He trudged out of the lounge, away from the stadium to his flitter. As the little craft with its windows opaqued flew to the hotel, he struggled back into his own clothes, just completing the change before the landing. He stepped outside onto a flitterport clogged with traffic: aircraft with government insignia,

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with tri-V emblems, a huge crush of flitters with more circling overhead.

Something critical had happened.

Thought and reaction were simultaneous. Cameron sprinted to the closest elevator, sent it downward to the tenth floor, emerging from it and nearly knocking over several tri-V men.

"You're on the UP staff, aren't you?" Both of them recovered, bracketed Cameron against the closed elevator doors. "What's Ronan planning to do? Will he make a statement?" "Will he cancel the speech?" They shouted to be heard over the angry gabble of volunteers jamming the hallway.

Cameron relaxed slightly. "I don't know. What's going on?"

The reporters' faces fell. They left Cameron abruptly but near him, a boy flushed with anger, blurted, "Manoc's been asking for this and we're finally going to give it to him. We'll go over there and clear those bastichs' out!"

"Wait. Clear what 'bastichs' and from where?"

"Manoc's damned—" His fury exploded into a stream of obscenities. "They say they won't leave the stadium. They're going to pack it, stay through the UP rally. There'll be no room for anyone else unless we kick them out."

"Half a second." Cameron forcibly restrained his information source. "If they're in the stadium illegally, the militia can—"

"Blast the militia!" The boy made an abortive attempt to free himself. "Besides, Manoc's creeps say they'll pay to stay for Ronan's speech. Only they'll never let him *talk*. The tri-V broadcast, everything will be ruined."

"I see." Cameron let him go and the tri-V men immediately attached themselves.

"Then do all of you plan to retaliate?"

"That's right! We're not taking any more—"

Cameron inched away from them, his back against the wall. The volunteers were split into a myriad of factions yelling at each other but soon, their rising rage would fuse them into one united mob out of anyone's control. He wondered, as he managed to reach Ronan's suite, how Ronan would react.

His answer came almost instantly. Preceded by a biracial group of UP candidates, Ronan emerged into the hallway, touching Cameron's arm in an abstract greeting. The older man's face was totally expressionless, as though in response to the hyperemotional atmosphere, he had sealed his own emotions deep within his mind. He started through the crowd of volunteers who moved aside to let him pass, the din in the hallway subsiding as people saw him. The tri-V men charged at him but Ronan shook his head, pointing. "I'm

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going to make a statement in the Conference Room."

In the ensuing rush, Cameron stayed at Ronan's elbow. They went into the large room soon filled beyond capacity with staff, volunteers, and tri-V men swearing at each other while jockeying for position. Ronan waited until the commotion subsided, then fixed his eyes on a far wall.

"This statement concerns the United Party rally scheduled for a planetwide tri-V broadcast at 1700 hours," he said in a monotone. "The broadcast will be held at that time"—the volunteers erupted in a cheer but he spoke through the noise—"from this hotel. The rally at the stadium is canceled. We urge everyone who planned to attend to stay home and listen to the speeches on tri-V." He paused, his listeners remaining in a choked, disbelieving silence. "We've made this decision because a violent confrontation by supporters of both parties could cause an irreparable break. There's been enough polarization, enough passion incited by the campaign. We wish to terminate it in the spirit of reconciliation which we hope will characterize Achates's future regardless of tomorrow's results."

"Ronan." One of the tri-V men pressed forward. "Previously, you've said that the election wouldn't be decided by intimidation or fear. Aren't you contradicting yourself?"

"Contradicting myself? How?"

"Well . . . won't most people assume that Manoc has intimidated you into staying away, that the canceled rally is an act of cowardice?"

"I can only give you our reason for the action," Ronan said laconically, "not how you or 'most people' interpret it."

"What about your volunteers?"

A general stir went through the room at the question. Ronan waited, forcing the tri-V man to add, "I mean, what do they think about it?"

"You'll have to ask them; I don't do their thinking."

A ripple of mocking laughter from the volunteers relieved the strain somewhat. The reporter scowled. "Before your statement, there was a great deal of very emphatic talk from your people about retaliation. Will you be able to control them?"

"No, not the control you mean, the manipulations of a puppet master. They work for the United Party voluntarily. All we can do is ask them to consider the consequences of retaliation."

"So you're disclaiming all responsibility for what they do?"

"No, not at all."

The reporter swung his head in a gesture of bafflement, then started a new tack. "Isn't it possible that if you let Manoc's provocation go unchallenged, you will discourage more voters than a fight would have antagonized?"

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"I don't believe so," Ronan said.

"But isn't it possible?"

Ronan's wooden expression did not alter. "Yes," he conceded. "It's possible."

"Cameron, you've been on my tail all day." Though the complaint was delivered good-naturedly, Ronan's voice held an edge of annoyance.

Cameron did not deny the accusation. He glanced out the hotel window at the city lights beginning to glitter through a murky red twilight, then put a hand on the wall and pushed against it. His arm muscles twitched spasmodically. His own mental state plus drugs produced a feeling of taut anticipation for the culmination of his plans . . . every action in two months taken for this up-coming moment on election night.

"Any particular reason for close surveillance?" Ronan inquired.

"I think so."

Ronan, reclining on a sofa with his shoes off, raised an eyebrow. "Relax, Cam. You should have been jumpy yesterday."

"Yes." Cameron remembered the tense waiting for a riot which never occurred . . . Manoc's people filing triumphantly out of the domed stadium at sunset . . . the precipitous drop in UP morale minimized only by the hectic election day schedule.

"Now all that's left is to wait until the returns come in," Ronan continued, "or try your skills at prophecy."

Prophecy was right, Cameron agreed silently. Trained observer that he was, he still found the general population's opinions unfathomable. Aloud, he asked, "When will you go downstairs?"

"When there's enough of a trend to decide whether the United Party should give a victory, or a concession, speech. The other time zone is already tallied so when those figures are released, we ought to have a good idea—or a bad idea."

Cameron faced him. "Would you call me up here before you go? I'll be at the election watch. There's something I want to tell you."

"What's wrong with now?"

"I'll tell you that, too." He saw Ronan's puzzlement deepen and forced a disarming smile. "Sorry. It's not as mysterious as it sounds. But it is important."

"All right," Ronan said. He seemed totally at ease. Very logical, Cameron thought as he left. From Ronan's standpoint, there was nothing more to be done . . . but how could a brilliant mind contain such a massive blind spot?

For a change, the hallway was deserted, almost alien-looking in its emptiness, the rooms unoccupied, several with their doors open. His room was remarkably uncluttered since his roommates were in Azurean hamlets for a last ditch voter drive. He went quickly to the visi-

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com. "Messages for John Cameron?"

"No messages," the impersonal robot voice replied.

"Recheck, please."

"No messages."

Cameron grimaced at a childish impulse to curse at the machine. "If there are in-coming calls, notify me in the ballroom, second floor." He waited for the visi-com's acknowledgment, then went down to the second floor.

Timing was going to be split second, dangerously close, closer than he ever gauged due to Manoc's clever reticence and the absolute necessity of waiting for definitive election results. He knew at least he wouldn't have the added strain of maintaining a calm facade; nearly any kind of behavior could be passed off as election night jitters.

Cameron paused momentarily in the entrance to the ballroom to observe the volunteers. The group was large though the ranks were somewhat thinned by those campaigning in the cold regions. The phrase, "members of a rag-tag, improbable coalition . . ." drifted through his mind. They fit the description tonight as they sat on the floor or chairs set up in the room—a listless, disheveled bunch of people of all ages talking desultorily, most dressed in the wilted clothes they had worn all day. The only activity was on the ballroom's stage where tri-V personnel scurried around to set up their equipment and at a temporary bar in business on one side of the room. An electronic tally board onstage was dark and two tri-V sets were broadcasting summarizations of the campaign—no returns yet, Cameron decided.

He viewed the scene speculatively. Assassination would be easy here as Ronan walked through the crowd, would produce the most dramatic effect, provided, naturally, the assassin didn't mind trading his own life for Ronan's. An ideological assassin for the ballroom; a pragmatic one for intercepting Ronan somewhere upstairs, finding an escape route and a way to collect his payment. Security precautions were almost negligible even after the bombing, the attitude of the volunteer militia saying that they were colonists here to develop a world, not police it.

Two assassins. Cameron swore bitterly at himself for overlooking the obvious. He could imagine Manoc relishing the idea, a tailored match to his clandestine philosophy. For professionalism, a trained killer; for insurance, a passionate killer willing to sacrifice himself; for optimum secrecy, each believing the responsibility was solely his. Perfect.

"It seems like an anticlimax. I was just telling Jesse that tonight feels like such a letdown, Cam."

Cameron turned to see Jesse and a dispirited Dreda behind him.

"I don't know what she thinks we're supposed to feel," Jesse said

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irritably, moving back and forth in a small, nervous dance.

"Expectant," Cameron offered.

Dreda giggled. "At least you can joke about it. Jess has been in a terrible mood all day."

"I'm going to get a drink," Jesse declared. He stamped away toward the bar, and Dreda's doleful look returned.

"He's mad at me."

Cameron broke off his own concentration, realizing its futility at the moment. "Let's get seats where we can see the board," he suggested. They started inside but halted in unison as the tally board blinked, came to life in a shimmering ripple of light: district numbers, total district population, candidates' names, a racing blur of figures.

"Most of these are from the other time zone," Cameron said, his words preternaturally loud in the hushed room. Dreda's fingers dug into his arm as the vote totals skipped by in dizzying progression, changing, changing, slowing, stopping, a patchwork of numbers finally static. There was a moment of breathless silence while everyone read up and down the columns, calculated; then yelling, shrieking pandemonium.

Dreda threw her arms around Cameron's neck, pulling his head down and kissing him. She spun away with a yelp of delight; Cameron smiled in spite of himself but backed up to avoid being caught in the revelry. He looked at the board again.

The statistics were undeniable—a United Party sweep. Approximately two thirds of the districts reporting had given UP candidates majorities. Not a single district listed had eliminated itself by the One Third Law. And slightly more than half of the total districts were tallied. Enough of a trend to convince him of the election's outcome, at last statistics instead of speculation. From them, it seemed Ronan's pessimism, Manoc's optimism, and the strident claims of Manoc's followers had camouflaged the real feelings of most Achatesians . . . not yet mutual trust but willingness to learn it.

Cameron knew what Manoc's response to the returns would be. He retreated to a wall visi-com. "Messages for John Cameron?"

"No messages."

The words released him. Cameron ran out of the ballroom to the elevator. Going up to the ninth floor, he sent the elevator down to make sure Ronan wouldn't pass him inadvertently, then located an exit and raced up the remaining flight of stairs. He entered the hallway soundlessly, keeping his back pressed against one wall. From his position, he couldn't see the door of Ronan's suite; however, the elevator doors were only a diagonal seven meters away from him.

A simple matter of judgment

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now. Ronan would be a better target immediately after he left his suite, before being surrounded by other candidates and UP staff who had watched the returns with him. At the elevator, all would be bunched into a group, though Ronan's height made him somewhat conspicuous. But between Ronan's suite and the elevator was a stretch of open hallway, thus the risk of pursuit and apprehension, even of an armed man.

Cameron crouched, sighted on the elevator. From where he stood, the odds on a successful assassination with a laser pistol would be favorable . . . though most favorable would be to fire from concealment. He scarcely needed to turn his head to see the room closest to him; he could have stretched out his hand to touch the frame of the open door. He straightened up and stepped away from the wall, calling, "Go on down and I'll be right with you. I have to get something in here."

Beneath his words, he heard the barest whisper of sound. Arms at his sides, hands open, he walked casually into the room.

The flash of movement came from behind and to Cameron's left. He pivoted sideways smoothly, catching the man's descending arm at the wrist, using the other's momentum to flip him over his back in a forward throw. On the periphery of his vision, he saw a small dark object arc through the air but disregarding it, brought the edge of his free hand down in a chop against the man's neck. In almost the same motion, he threw himself across the room in a flat dive, recovering the dropped laser pistol, rolling over to aim it at a person standing in the doorway.

An ashen-faced Jesse Colan threw an arm up in a useless reflex gesture. With a mutter of disgust, Cameron lowered the pistol. "Relax. I'm not going to shoot you . . . but knock next time before you come in."

Jesse swallowed twice. "What . . . what happened? Who's he?"

"Why are *you* here?"

"I . . . we . . . wondered why Ronan hasn't come down to the ballroom yet. I wanted to find out. I heard noises in here . . . this is my room—"

"All right." Cameron cut off extended explanation. "Go downstairs and tell some of those supposed security people to get up here. They'll never hear a com signal in that bedlam."

"But . . . was he trying—"

"Damn it—go down!"

Jesse jumped involuntarily at the order. As he disappeared, Cameron bent to verify that the chunky, balding man on the floor was still unconscious. Looking at Manoc's hired assassin, he felt no exultation, only a burning need to hurry. Split-second timing indeed. He had to reach a subspace transceiver immediately, send his report to the

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Federation in the brief interval while Manoc waited for news. Knowledge that the Federation understood the real situation on Achates would halt Manoc's takeover. Otherwise, the *coup d'etat* attempt—successful or not—could generate enough violence to shred the fabric of the planet's forming society beyond repair.

The government communications center had a subspace link-up but the spaceport facilities would be more dependable, Cameron decided, setting the visi-com for an intra-hotel call. The signal bleeped repeatedly until the image of one of the UP candidates materialized.

"Let me speak to Ronan."

The candidate pointed to his ears and shook his head. "Talk louder!"

"Ronan. RONAN!"

Cameron finally received a nod of comprehension and in several seconds Ronan appeared, wearing a grin of boyish delight.

"Cam. I've been trying to locate you, but it's chaos down there. We're about to join them and see if we can interrupt the party for a short speech."

"*No*. Don't, Ronan. Not yet. Wait until I call you back in about . . . twenty minutes." Ronan set himself to ask why, but Cameron knew there wasn't time to untangle the skein of lies he created since his arrival. "I've found out that someone's planning to assassinate you on Manoc's orders," he compromised. "I'll send security personnel to your room, then give you more details as soon as I can. Will you wait in your suite?"

"Manoc wants me assassinated?" All traces of humor left Ronan's face. "That's a macabre joke."

"I'm serious."

"But—"

"Later. I'll explain later. Will you stay where you are?"

Ronan said dubiously, "Yes . . ."

Cameron choked back further argument and shut off the com. He reached down, prodded the man on the floor in a few sensitive spots until he groaned and tried to move away. "Get up." Pulling the other to a standing position, Cameron put the laser pistol under his ear. He couldn't wait any more for the haphazard security forces. He started to walk the man toward the door when Jesse charged into the room.

"There's so much confusion I couldn't find any of them—" he began breathlessly.

"Never mind." Cameron moved his prisoner forward as Jesse circled around behind him. He pushed the man into the hall—and glimpsed a blurred impression of two men outside.

They hit him before he could brace himself, slamming him into the door frame with stunning force. He fired the laser instinctively. The man he had been holding suddenly slumped against him; then he was pinned to the floor by the

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combined weights of three people. He heard the hiss of a stunner spray as he struggled to break free and twisted his body in a muscle-wrenching jerk. For an instant, he was loose but someone drove a knee into him. He doubled over with a gasp of pain cut off by a hand clamped over his mouth.

Cameron tried to pull his head away, realized sickly that there was an abrupt lag in his reaction time.

"Does it work that fast?" Jesse's voice.

"Usually."

He felt the pressure of the hand relax and his head slipped involuntarily to one side. He found himself looking at an expanse of green carpet which refused to stay in focus.

"What if he's faking?"

The blow across Cameron's mouth produced a tingling numbness but no pain.

"He isn't."

The weight on his chest and legs disappeared.

"We've got to get him out of here. Egan, drag that body into the bathroom. You, Colan, help me with him."

Cameron saw Jesse's face loom over him; then the room did a nauseating spin as he was hoisted onto his feet. He felt himself being supported on either side and fought desperately to maintain his orientation as he was half-carried into the hallway.

"What happened to him, Jess?"

". . . Got sick suddenly. These gentlemen . . . going to help me take him to a doctor."

Cameron forced his head up. A group of humans, a blue-furred Azurean in front of him, faces hard to distinguish . . . "No—" He heard his own words, slurred, unintelligible. "No . . . it's not—" He paused, forgetting what he wanted to say.

"His lip's bleeding."

"He fell down and cut it. Just passed out—"

"But Jess—" The voices faded in and out. ". . . First aid in the hotel."

"No, it's all right. We'll take care of him." They were inside the elevator. Doors closed . . . opened . . . fast ride. A welcome breath of night air. Cameron thought he might be able to wake up if he could stay outside and not go in the flitter . . .

The dream seemed interminable and very disagreeable. He was being slapped brutally, repeatedly for no reason he could remember at the moment. A ring of faces watched him.

"All right. Stop." Fingers pressed under his chin tilted his head backwards. "Do you hear me?"

Cameron coughed, swallowed convulsively. His nose was bleeding copiously. "Yes." He squinted past Manoc at Jesse, two impassive mercenaries, and an unfamiliar room beyond them.

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Manoc slammed him across the eyes. "Then listen to me! Listen to me," he repeated, his voice soft but trembling with anger. "You're going to give me a lesson in cryptography so the Federation can get the report it expects from you."

"I've already sent it." Still half-dazed, Cameron lied automatically.

"No. You've outsmarted yourself, Cameron. Your action tonight showed your true motives. Since you came to me, you've been trying to maneuver me into some incriminating act, to force me into moving prematurely, haven't you? Attempted bribery of a Federation official wasn't substantial enough to destroy me so you had to wait until you had indisputable evidence—but you ran out of time unexpectedly. My destruction: that was your purpose from the beginning!" Manoc stepped back, collecting himself. "I want your report code."

Cameron shook his head, a dull sense of resignation and failure penetrating the drug haze. "Your purpose now is my destruction, whether I give you the code or not."

Manoc smiled thinly. "In any case, from your professional standpoint I wouldn't deprive you of first seeing the successful execution of my plans. Jesse, go on back to Ronan."

Jesse drew himself to rigid attention. He spun around, hit the door unlock button, and started outside; then recoiled so violently that he nearly fell over backwards.

"There are tri-V people all over the hall!"

Manoc rapped out an obscenity and charged over to a table visicom. "Barret! What in hell's going on out there?"

"Manoc, you said not to disturb you under *any* circumstances—"

"Don't argue with me! What are they doing?"

"They're only the vanguard. Ronan's walking over here."

Here, Cameron realized, assimilating the conversation, was Manoc's campaign headquarters, an office building a kilometer away from the hotel.

"What?"

"That's what he said on tri-V," Manoc's aide continued, "and it looks like he's brought half of the capital with him. Some of the militia, too."

"What do you mean, 'looks like'?"

"They're outside. See for yourself."

Manoc reached the window in two long strides. After a long moment, he moved back to the visicom. "What reason did he give, Barret?"

"He just said that he wanted to talk to you. Why do you think he's—"

Manoc cut him off, switching to another station. "Get me Colonel Feylam."

Cameron stirred. When no one seemed to react, though one mer-

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cenary waved his laser pistol negligently in a warning that he was still under guard, he rose unsteadily and staggered over to the window.

The crowd surrounding the building was enormous, the street clogged in both directions with people, like an overflow of the celebration Cameron had left minutes . . . hours . . . ago. Half the city was hardly an exaggeration of its size, he thought muzzily. It would be a biracial crowd, too, with humans predominating. Cameron retracted his imputation of Ronan's blind spot. His brief warning, a confused interpretation by witnesses of his kidnapping, possibly the discovery of the mercenary he had inadvertently shot . . . With these, Ronan evidently had deduced Manoc's plan, then moved quickly, brilliantly to block it in the only possible way: using the voters' overwhelming mandate for a united Achates to isolate Manoc—and expose him.

Manoc started, "Get away—", then turned as the visi-com screen revealed the mercenaries' commander.

"Feylam here. We're ready to move on election return centers and the government offices you indicated."

"Delay that," Manoc countered. "I need men and equipment here immediately to disperse this crowd."

"My men are already deployed and spread too thin to suit me."

"I said get some of your men over here!"

Feylam inquired: "Which ones?"

"How do I know? You're their commander."

"*You* have to put the priorities on your own targets."

"*This crowd* is my first priority."

Cameron said, "Stampede them, gas them, kill them over planetwide tri-V and you'll have more crowds than the mercenaries can handle. A *coup d'etat* involves small strategic acts of violence performed in secret; this will be overt violence by the masses—revolution. Under such circumstances, the Federation won't recognize the legitimacy of any government."

Manoc began venomously, "Shut up, Cameron—"

"But he's right," Feylam interrupted. "Federation observers see enough power plays to know." He blinked. "No matter. We'll break up the crowd, kill as many of them as we can, then take the other targets. Once you're officially in control of the government, you can use government troops, such as they are, for pacification. My men pull out in thirty hours from now."

Manoc shouted, "Wait! You were hired after the *coup* . . ."

". . . To consolidate your position. Yes. A relatively quick and simple affair, particularly when I thought you had the observer's cooperation. But that's not the same as getting tied up in a full-

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scale revolution on a Federation colony. Revolution brings in the Fleet."

"That crowd out there doesn't constitute a revolution."

Cameron sighed and leaned back against the wall. "Yes it does, the beginning at least." Without flinching, he watched Manoc snatch a laser pistol away from one mercenary and aim it at him. "Go ahead. I've failed anyway. A revolution will almost certainly destroy you—you've depended too much on external forces—but it'll destroy the colony as well. A Pyrrhic victory."

Manoc reversed his grip on the pistol and hit Cameron on the side of the head. Cameron rode with the blow somewhat, the force still knocking him off balance and replacing the room with a painful display of lights.

He heard Manoc say, "He's trying to save his own neck. Don't listen to him."

"Actually I wasn't," Feylam replied. "I live by looking after *my* neck. I made my decision as soon as I saw Ronan taking that crowd to you, forcing a confrontation before the fact."

Manoc's voice pitched up into a scream. "Confrontation by an unarmed rabble!"

"You're missing the point." Feylam shrugged. "My men will capture the government machinery, scatter that crowd—and leave. Ronan just went into your building, by the way. Do I have your order to proceed?"

Pushing himself up on hands and knees, Cameron watched Manoc stare, mesmerized, at the screen. He bit his lip to keep from speaking, knowing there was nothing left to say now. Manoc needed to make his most crucial decision alone, a decision Cameron had often seen imposed on those who ultimately based their power on coercion.

A sharp knock on the door startled everyone in the room. Manoc gathered himself in a quick, feral movement, his glance darting from the screen to Cameron to the window. He half-turned, poised for an instant. Then, slowly, he lowered himself into the closest chair, his eyes glassy with disbelief.

With the vitality drained, he was simply a deflated little man, Cameron thought, surprised that he hadn't noticed before how small Manoc really was. Light-headed with reaction as well as drug aftereffects, he got up and stumbled to the door past a stupefied Jesse Colan.

Ronan stood outside in the hallway, the focus of tri-V cameras, members of his and Manoc's staff milling around behind him.

Cameron gave him a lopsided smile. Oblivious of blood-spattered face and clothing, he extended his hand. "Congratulations from the Federation . . . and from me . . . Mr. Prime Minister." ■

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P. Schuyler Miller

CONVENTION ADDENDA

The October issue of *Luna*, a monthly SF news magazine published by Ann and Frank Dietz, 65 Orchard Street, Oradell, New Jersey 07649, is in with a round-up of news from the St. Louis convention. (*Luna* is $3.00 a year—$3.75 if you want it by first-class mail—and appears to have taken over from the venerable *S.F. Times* as the field's leading news sheet.)

As I reported, the 1970 World Science Fiction Convention will be held in Heidelberg, West Germany. Dates: August 21-24, 1970 (Labor Day means nothing in Europe). For information or a membership, write to Heicon 70, D6272 Niedernhausen, West Germany. Supporting membership, which gets you advance literature et cetera, costs $2.50; $4.00 if you plan to attend. Checks and international money orders—probably the best way to pay—should go to Mrs. Thea Auler. The New York/New Jersey contingent plan to charter a plane for a three-week science-fictional tour, including the convention and returning before Labor Day.

Now that the conventions have been held twice in London, once in Toronto, and now in Germany, fandom is abandoning the World Series myth. There will be a Worldcon every year, with North America bidding on a par with the rest of the world (Tokyo is interested, among others). The Worldcon will come back to Boston, and to the Labor Day weekend, in 1971, but thereafter there will be an independent North American Science Fiction Convention rotating on a regional basis as in the past. Bermuda, which also put in a bid, will be part of the eastern region.

Meanwhile, with no convention in the States, the West Coast group are promoting the annual Westercon (No. 23) as a replacement for footloose fans who can't make it to Germany. They use the July

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3-5 weekend—better weather; better rates. The place: Goleta, California, on the coast a few miles from Santa Barbara. Jack Williamson will be guest of honor and principal speaker (Bob Silverberg, England's E. C. Tubb, and Germany's Dr. Herbert Franke share the honors in Heidelberg). The program will be good; the Westercon gang are veterans at this by now.

You may have gathered by now that there are many, many regional conventions as well as local meetings of SF and fantasy fans, on all levels: social meetings, elaborate and serious programs, no-program weekends like the Midwestcons in Cincinnati. I usually don't learn about the big ones far enough ahead to pass the word to you, and this is *not*—repeat, *not*—a fan department. However, you'll find nearly two pages of coming meetings in the October *Luna*. Among those still to come: Boskone, Boston, March 27-29; San Francisco, same weekend; Minneapolis, April 3-5; Brooklyn (the Lunacon/Eastercon), April 10-12.

Oops—I almost forgot. For information on the Westercon, write Fred Patten, P.O. Box 4456, Downey, California 90241. For membership, send $3.00 to the same address—you'll pay $2.00 more at the door if you attend.

Bibliographical Postscript: Fred reports, via the Library of Congress card for "The Rebel of Rhada," that the pseudonymous "Robert Cham Gilman," who is writing the excellent Rhada series of juvenile SF books, is Alfred Coppel, a writer with a good few SF yarns in the magazines under his own name.

ORBIT 5

Edited by Damon Knight • G. P. Putnams Sons, New York • 1969 • 222 pp. • $4.95

These anthologies of original stories are published twice a year and are providing the prize-givers with a mine of good new stories. They are also proving to be a better source of intelligible "New Wave" stories than either Judith Merril's annual anthologies or Harlan Ellison's new-story colossi (Berkley has brought out "Dangerous Visions" in three giant paperbacks). "Orbit Three," coming late in 1968, had two Nebula Award winners: Richard Wilson's "Mother to the World" and Kate Wilhelm's "The Planners." It is now available as Berkley No. S1608 for 75 cents. "Orbit Four," the first 1969 volume (Berkley No. S1724, also 75 cents), hasn't been out long enough to win any prizes, but it has a unique law-and-ESP story in Charles L. Harness' "Probable Cause" which deserves to be in the running, and some close contenders in stories like Kate Wilhelm's "Windsong".

The second 1969 "Orbit" is further from "straight" science fiction than any to date and has fewer fan-

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tasies—really, only Avram Davidson's very short "The Roads, the Roads, the Beautiful Roads" and R. A. Lafferty's wholly non-ethnic "Configuration of the North Shore." Unless I have missed a few layers of inference and symbolism, Langdon Jones's "The Time Machine" is simply the story of a prisoner using the time machine of his memory to bring back a love affair. "Paul's Treehouse" by Gene Wolfe is the low-key story of a suburban family not quite able to prepare for next year's totally savage riots. And "The Price" by C. Davis Belcher—one of the best stories in the book—is about one already perplexing aspect of present-day medicine: is the donor of living organs transplanted into another person still legally alive?

There remain seven perfectly good science-fiction stories by anyone's standards. The most conventional—and a lovely little switch on the time paradoxes of faster-than-light flight—is Ursula LeGuin's "Winter's King," which follows "The Left Hand of Darkness," her impressive novel about the world men call Winter. The most frightening is Norman Spinrad's "The Big Flash," in which a faction in the Pentagon uses a Rock group to counteract the peace drive of the Flower Children and turn the young on for a "beautiful" nuclear war. Don't think it can't happen!

Most enjoyable? That's Carol Carr's delightful little tale of a nice Jewish girl married to a Martian vegetable, as told by her protesting father, "Look, You Think You've Got Troubles." Another switch on the child genius theme? That's Kit Reed's bitter "Winston," in which the author shows us a society where successful status seekers can buy an infant genius, certified Ph.D. grade, for the price of a good car. Old-fashioned Analog-type SF? Astronomer "Philip Latham" (R. S. Richardson), in "The Rose Bowl-Pluto Hypothesis," suggests a startling reason why those track records are falling so fast. Is space shrinking? Finally, James Sallis's brief "The History Makers," is a borderline story of the thin line between dream and reality, of the kind K. G. Ballard visits in his (to me) more successful stories.

THE DAKOTA PROJECT

By Jack Beeching • Delacorte Press, N.Y. • 1969 • 229 pp. • $4.95

This book by an English poet-in-residence at a North Dakota university carries a 1968 copyright, which presumably refers to its British edition. If Delacorte had been a little faster on the draw, it might have beaten "The Andromeda Strain" to the shelves if not to the best-seller lists.

The narrator, an English writer, is hired as a technical writer for the top-security American military project. (Why is never very clear; maybe the author has fits of won-

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dering why he was in Dakota, too.) He soon discovers that the Dakota Project is very queer indeed. Once inside the fences and minefields that enclose the project, only the top executives ever get out—alive. Protesters and mavericks come down with embolisms and only their ashes leave. Mexican whores are employed as meatpackers to soothe the passions of the lower echelons. Every room is bugged.

Our hero—being our hero—revolts at all this. He ferrets out the secret of the project and allows himself to be drawn into an ill-fated revolt led by a group even less stable than he. Yet even at the end we are never really told what the Project is and how it is to be put into effect. Apparently the peoples of the "underdeveloped" lands are to be sterilized through a protein supplement generously contributed by Uncle Spam. Apparently the surplus population of our own slums, as well as of foreign parts, is to be converted *into* a substitute for canned corned beef. (Passing acknowledgment is made to Dean Swift's prior proposal anent Irish babies.) Apparently the whole thing has been worked out by the equivalent of a Rand group, as a direct, pragmatic means of solving the runaway population problem and simultaneously staying on top of the remaining heap.

Do we have the kind of government, in the Pentagon if not in the White House, that would set up a Dakota Project? Are you sure? And if such a project were to go into effect, would you be an eater or an eaten?

TO LIVE AGAIN

By Robert Silverberg • Doubleday & Co., Garden City, N.Y. • 1969 • 231 pp. • $4.95

This book falls somewhere between the "new" Silverberg of such books as "Thorns," "The Masks of Time," and "Hawksbill Station" and the "old" Silverberg of more conventional books. It has the intricate and interesting characters we have come to look for in his more ambitious novels, but they are outweighed by a gimmick—persona transplantation, or "soul banking."

The book's assumption is that the pattern of inherited and developed mental reactions we call a personality can be transcribed, recorded, and imprinted on another individual after the first is dead. The process is expensive, both for the person who keeps up-to-date transcripts of his persona in the soul bank and for the wealthy, or powerful, or socially prominent individual who adds the personality of a great financier, or artist, or politician to his own.

The book's ostensible plot is the rivalry between two tycoons for the persona of a third, dead but not yet assigned to anyone. Neither will stop at anything in his power,

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and they are perhaps the world's most powerful men now old Paul Kaufmann is dead. Actually, the most interesting part of the book is the sub-plot in which Risa Kaufmann, dead Paul's teen-age niece, makes her first experiment with a persona transplant and finds that having another, very different person in your head with you can have an unexpected maturing effect. Risa—not her father nor his rival, John Roditis—is the most interesting person in the book.

No awards for this one, I'm afraid.

THE PALACE OF ETERNITY
By Bob Shaw • Ace Books, New York • No. 65050 • 222 pp. • 75¢

In issue No. 32 of *Science Fiction Review*, an occasional fanzine, Ace editor Terry Carr has an interesting article on the Ace Science Fiction Specials—how they originated, and what he hopes to do with them. They haven't all been "great," but every one of them has been out of the ordinary, and this novel by the creator of "slow glass" is no exception.

The book begins like what might have been one of Gordon Dickson's studies of *Home militariis* as he takes over a quiet backwater planet that had thought itself completely safe from the vast galaxy-spanning Man versus alien war. Mack Tavernor, a victim and veteran of that war, has found a haven there among Mnemosyne's poets and artists, even though he is only a technician himself. Then the Military comes to Mnemosyne and changes it overnight . . . and Tavernor finds himself a rebel without a real cause. Two-thirds of the way through the book he dies, and the real theme appears.

The switch is to something A. E. van Vogt might have thought of and has, to a degree, suggested in some of his less successful books. His comments on the cover show his tastes haven't changed. But for me the "message" of the final chapters degenerates to a mere gimmick that dilutes the harsh power of the first part. I never really believe in the Egons, or in the adult Bethia.

SIX GATES FROM LIMBO
By J. T. McIntosh • Avon Books, New York • No. V2274 • 191 pp. • 75¢

Practically every practicing, or would-be, science-fiction writer, I am sure, has played with the extrapolation of Frank Stockton's venerable "Lady or the Tiger" mechanism, in which someone can step through any of a series of matter transmitters or teleportational "gates" into other unknown places and times. Sometimes the gates are essential to the plot; sometimes they are a technique for bringing saviors or devils unexpectedly out of nowhere; and sometimes they are just there to give the author a mildly plausible ex-

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cuse for inventing strange worlds.

This long book by the Scottish writer, who is undergoing a vigorous revival, seems for most of its length to fall into the latter category. Its hero, Rex, wakes with no knowledge of self or past in a totally enclosed, not quite self-sufficient world he dubs "Limbo." In due course he finds there are also two women in suspended animation with him, and that there are six "gates" in the intangible wall that encloses their pocket world. They go through, of course, and find themselves in six psychotic worlds—frontier posts of mankind, where man's drive through the galaxy is running out of steam.

So, in the final chapters, it begins to appear that there is a valid reason for all that has been happening to them. How valid it is is for you to decide when you've read the book; I'm not really sold on the secret of the gates.

MASQUE WORLD

By Alexei Panshin • Ace Books, N.Y. • No. 02320 • 156 pp. • 60¢

In a letter to *Science Fiction Review* No. 32, a frequently fascinating fanzine published at fifty cents a copy by Richard E. Geis, P.O. Box 3116, Santa Monica, California 90403, Alexei Panshin reveals that his Anthony Villiers stories are "a single novel in seven episodes," of which this is the third. This may account for the fact that in this book his hero seems to be marking time—a problem that has arisen in other story sequences (even, for some readers, Tolkien's grand "Lord of the Rings" triology.)

It has been evident from the beginning of the first Villiers book that various forces and people of importance were operating offstage, or were represented in the immediate action only by agents. For me, this adds to the spice; it is one of Andre Norton's best techniques. On the other hand, it is exasperating that as obviously important a character as Torve the Trog mainly stands around giving no indication at all of why he is important and why Villiers hauls him around all over the galaxy.

This time Villiers and Torve drop in on a planet called Delbalso to visit Villiers's uncle, Lord Semichastny. That eccentric lordling is on the verge of being run off the planet by something called the Winter-Summer laws, and in the mood to throw a masquerade party which goes almost totally wrong—but is all the more successful for that. Other peculiar people and activities weave in and out of the action, but the whole book gives the impression of marking time. When the sequence has evolved, it will undoubtedly turn out that the first four words in the fifth line from the bottom of a page partway through the book are the key to all sorts of mysteries. (Some masterful mystery writers have de-

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veloped that trick to a fine art.) Meanwhile, I still say you shouldn't miss the first two books, "Star Well" and "The Thurb Revolution," and please give the rest of the series a chance. Next volume: "The Universal Pantograph" (two professional pantographers—who are astrologers by avocation—are allowed a walk-on bit as Marvels of Schermerhorn House in a competition of the Xochitl Sodality, if that helps you figure what is coming next).

GALACTIC POT-HEALER
By Philip K. Dick. • Berkley Books, New York • No. X-1705 • 144 pp. • 60¢

No. Waldo . . . Mr. Dick is not urging a "pot" centered society upon us. The pots that Joe Fernwright "heals" are the things that grandma used to call "crocks" when she made pickles in them, and Aunt Sophie called "vahses" when she used them for bouquets, and archeologists use to support vast and impressive hypotheses of human and cultural flux. Joe just fixes pots—better than new—in a crazy future Welfare State. Then a vastly ancient shape-changing monster from far, far, far beyond anywhere hires him and a shipload of other specialists to raise a pagan cathedral out of the sea on a bizarre world.

The whole thing is fascinating in a surrealistic sort of way, but never as believable as—for instance—Samuel Delaney or Avram Davidson would make it. The pot healer and the other technicians never get a chance to do their stuff, so there is never any logic to their having been selected. They do serve another purpose, but that seems to be pure luck. If there is deep significance anywhere, I missed it.

WORLD OF THE STARWOLVES
By Edmond Hamilton • Ace Books, N.Y. • G-766 • 158 pp. • 50¢

In this "Starwolf" series Edmond Hamilton is demonstrating that he has lost none of his talent for fast-moving, believable space opera. Little by little we're also getting acquainted with the future world in which Starwolf Morgan Chane lives . . . in many ways a counterpart of the "Hub" civilization of James Schmitz's yarns.

If you've forgotten, Chane is exiled from Varna, the home world of the predatory Starwolf culture and has managed to cast his lot with a company of galactic mercenaries. This time some other predators are trying to use him as a cat's-paw to get their hands on a set of fabulous "jewels" known as the Singing Suns, which are the focus of an intricate pattern of double, triple and multiple-cross. So Chane enlists the help of the Starwolves themselves . . .

Hokum, certainly—but the best hokum.

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TWO HARDBACK REPRINTS

Walker and Company have added two more hardbound reprints of books which have had only paperback publication in the United States:

"THE LEFT HAND OF DARKNESS," by Ursula K. Le Guin (285 pp.; $4.95). Reminiscent of "Dune" in the way it creates a strange world and a society to fit it.

"TROUBLE WITH LICHEN," by John Wyndham (160 pp.; $4.95). One of the better stories about the problems of longevity. Walker has also reprinted his "The Midwich Cuckoos."

NOTE FOR COLLECTORS

The Australian Science Fiction Association has continued its bibliographical work with two more mimeographed indexes, one of which should be of special interest to Analog readers. They are a two-part "Index to British Science Fiction Magazines," with Part Two devoted to the English edition of Astounding Science Fiction during the 1939—1953 years. I got my copies from Dick Witter at F & SF Book Co., P.O. Box 415, Staten Island, New York 10302 for fifty cents each.

Part One of the British index covers three all-British magazines which are really collectors' items nowadays. "Scoops" was the world's only science-fiction weekly in its time—now we have the German "Rhodan" magazines. It was a large, poorly printed, elementary juvenile SF magazine in the tradition of British "boys' " magazines, and it lasted for less than a year in 1934. "Tales of Wonder" was launched in 1937 by Walter Gillings—who has a new magazine that I haven't yet seen—and was killed by the war in 1942. It was a quarterly that used many reprints but tried to develop new British writers in a way that "Ted" Carnell was able to do later with the original *New Worlds* and *Science Fantasy*—subjects, I hope, of future indexes in the Australian series. "Fantasy" lasted for only three issues in 1939 and was apparently something like our present *F&SF*, open to both science fiction and fantasy and pretty selective.

The introductory commentary by the anonymous compilers of these indexes is the source of the above information. The same source points out the major differences between the English and American editions of Astounding during the 1939-1953 period. The British Astounding was not just a reprint of the U.S. edition, but quite different in content and layout—monthly until 1942, when the wartime shortage of paper in Britain forced many magazines to suspend publication, and bi-monthly thereafter. During the war years non-fiction and serials were often omitted, the commentators report.

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brass tacks

Dear John:

Since you're apparently in favor of research into racial intelligence differences, I would like to suggest some other lines of research to you.

Let's start with some research into just what a race is, and how one might find an example of a member of *one* race in America. Would it be sufficient, for example, to use a colorimeter to determine the degree of brownness—or yellowness, or redness—of the skin? Unfortunately there are "pure" Africans—or some African-Arabs, which might be a little hard to be certain of—who are lighter in color than some American half-breeds, who have thinner lips than some American Jews, and who have better educations than some American residents of Georgia who are pink. It's going to be a little difficult to select subjects for a *scientific* study of racial differences, even after one has a lovely experimental design all set up and waiting. Of course there are some people who seem to have evolved some simple methods for determining race: anybody who is dark enough and is found in the poor ward of a South Carolina hospital, for example, or anyone suffering from sickle-cell anemia. ("Sickle"? I swear that isn't right, but it is.) (Oh, I'm thinking of "scythe".)

Then there's the problem of figuring out what to measure. "Intelligence" is a nice everybody-knows-what-it-means word, but in fact it is measured and defined by a series of tests: your intelligence is your score on an intelligence test. Furthermore the definition is similar to "pressure": an intelligence test is inherently inapplicable to individuals just as the term "pressure" is inapplicable to individual gas molecules.

An intelligence test is a test, period: it is presumed to have

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something to do with ability to learn, or think abstractly, or count, but those assumptions are all based on another assumption: *all other factors being equal.* We need a little more research on that one, too.

How do you measure the intelligence of a person who has been raised at the bottom of the social ladder, whose schooling has consisted of a whack on the head and a grunt and a lifetime of facing tolerant amusement and barely-veiled hostility toward one's best and only Self? If you select persons who have had educations in an atmosphere free of hints of inferiority, you have to narrow the choices so far that your sample is biased in the other direction—that is, if you can find any sample at all. And how do you allow for cultural differences which, for instance, might cause a person to feel that elegant and precise speech, abstract thinking, and reading a lot are signs of snobbishness and of having been bought by the White Man? And how do you adjust for a mental attitude that says, "I don't know nuthin', I never will know nuthin', and whatever it is they ask me to do I probably can't do."

As far as I am concerned there is no valid way to investigate racial differences in intelligence. We can't isolate a pure race, we don't know what intelligence is, and we can't equalize the non-genetic factors. Furthermore intelligence tests are mass measures, valid only over thousands of tests in their predictive power and wholly unfair as criteria to judge whether or not a given individual is as bright as he seems on the test, or as dull. When I choose an apple to eat, I don't ask whether apples of this type are generally riper than others, or freer of worms or less subject to damage: I inspect the one I'm being invited to eat.

The prime movers behind efforts to get scientific respectability behind studies of racial intelligence are gentlemen from the South, who defend the importance of this kind of study not just for scientific reasons, but also because of possible importance in the realm of mixing of races: if negroes are, on the average, less intelligent than white people, then intermarriage will drag down the average intelligence of the mix. They wish to show that there is a difference so that they can defend the feeling *that they already have* about intermarriage.

This brings me to the last point. It is probably true that with the best of modern techniques one could arrive at a judgment of the relative intelligence of two races. One could also arrive at a judgment of the relative intelligence of Poles, Scots, people who hate negroes, people who are religious, and magazine editors, not to men-

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tion Indians—both kinds—Chinese, and professors in southern universities. The choice of what one wants to call a group is made by his subjective preferences and what he has in the back of his mind to do with the information. Some people would like to test *everybody,* and simply divide them into smart and dumb, only the smart ones, of course, then being allowed to breed whether white, black, or Protestant.

I submit that it is impossible to justifiy a scientific study based on race, especially in the hazy realm of intelligence. Try reconsidering, John.

WILLIAM T. POWERS

Dear Mr. Campbell:

I thoroughly agree with your contention that psi phenomena warrant serious and conscientious investigation, and usually I applaud your efforts to popularize the issue. However, in your recent article, "Political Science—Mark II," you do not only the National Academy of Sciences but also yourself and your readers a grave injustice. I am sure that you quote Dr. Seitz correctly; I am also sure that your interpretation has no relation to the situation.

Please recall that in the role of scientist a man can do basically only two things; he can measure, and he can try to explain his measurements. When Dr. Seitz states that "it is essentially impossible to do good research in this field as long as there are such great social inequities," he means simply that we are considering a phenomenon which at present is impossible to measure.

Consider the highly charged issue which you contend the National Academy of Sciences is avoiding out of political expediency. Let us assume that we intend to establish whether or not there is a genetic difference between the "intelligence" of the white and black races as they exist here in the United States. Ignoring all the work, good and bad, that has been done on this question, we are confronted with a series of problems.

First, "intelligence" must be defined. Since the genetic potential for it is not affected by environment, the definition must avoid any cultural or educational biases. This has yet to be done satisfactorily.

Second, a measure for this phenomenon must be developed —no competent social scientist can say that a culturally unbiased measure of "intelligence" exists, or that the techniques for building one exist.

Third, it will be necessary to isolate all factors which influence "intelligence" in a non-random fashion so that the influence of genetics can be identified. One difficulty, the one which Dr. Seitz mentions, is that the effects of the social inequities manifest through-

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out this society—environment, because they cannot be measured, cannot be isolated.

This and other similar difficulties could be handled by a well-established technique. In order to estimate the influence of an unmeasurable factor another group, called a control group, is isolated in such a way that all but this single factor operate normally. In non-experimental research, such as that under discussion, such control groups cannot be made; they either exist or they don't exist. In this case they don't exist. One way to summarize what I have been trying to say is that the technology of our too much exalted scientific method is at present and will remain in the foreseeable future far too primitive to justify any serious attempt at the solution of this specific problem.

But let us suppose for a moment that someone of peculiar genius and inventiveness does produce a valid treatment of this problem. Then two issues remain to be dealt with: scientific ethics and relevance. That there are large numbers of black people who can and do function exceptionally within this white society suggests that whatever genetic effect there might be cannot be debilitating. It suggests that whatever difference may exist between the mean performances of the two races cannot be so much a matter of genetic "intelligence" as it is a

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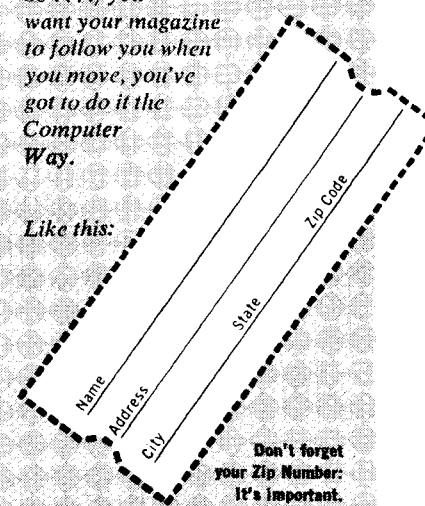

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matter of the society's ability and willingness to develop and take advantage of this intelligence. If this is so, then the above mentioned piece of research cannot hope to shed relevant light on the question at hand—the society's ability and willingness, and it would only serve to fog and complicate an area which is too far gone in both these respects already.

When one considers that which scientists will not investigate, one must be careful to avoid problems which scientists cannot investigate. It may well be that our shared opinion that scientists will not investigate psi phenomena rests on a shared ignorance of the intricacies of the problem. From this point of view it seems apparent that a more fruitful approach for you would be to advertise how this problem could be investigated rather than how it is not being investigated.

Propaganda is a valuable device, and generally you use it well; but you risk losing the respect and the attention of your readers when you misuse your information so blatantly.

JOHN CARY ROUNDS
190 Cannon Road
Wilton, Conn. 06897

In essence, the point made in both of your letters is that the proposed research on the unresolved question of race and intelligence would be extremely difficult, and require development of new techniques, new parameters, new and sharper definitions. And, therefore, the problem is too difficult so it shouldn't be attempted.

What you're saying is that scientific research should not be expected to try to explore unknown areas, to develop unknown methods to solve the really tough problems. That Science is for playing in convenient back yards that are already sufficiently mapped that we can proceed easily and smoothly to solve known problems by known means.

Nothing really difficult, nothing in areas as yet unmapped—just the sure and easy things already carefully demarked.

That way Science can retain its Image of Certainty and Security and Omniscience.

Gentlemen, I'm all too well acquainted with that attitude. That's precisely the attitude shown—as I said in that "Political Science—Mark II" item—toward another hard, unmapped area, psi. That's why I made the comparison.

It's the reaction I got forty years ago when I started writing about trips to the Moon, and Mars, and the stars—talking about atomic power plants and such "pseudo-science fantasy."

"We don't know how to do it; therefore there is either nothing real there to do, or it is too difficult to be worth solving."

I agree in full that we have no usable definition of "race," or "in-

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telligence," or "superior," or even "different."

But I most decidedly do not *agree that those facts mean we should ignore the whole shemozzle that's resulted because of our ignorance—that Science has no responsibility for studying the tough problems. I will not let the National Academy of Sciences off with studying only the easy problems that have already been mapped out for them.*

And I will not let the psychologists and sociologists off with rejecting responsibility for defining those terms that they're so happily juggling around. I remember discussing "group psychology" with a professor who said that was his specialty—and discovering he had no definition for the term "group." And a respected major University was funding his research without questioning his failure to try to find out what he was talking about.

If sociologists are going to talk about "race tensions"—then by God, they have to define what they mean . . . or shut up until they can!

If Science is going to declare psi phenomena impossible, then they must issue a defined definition of the limits of "possible phenomena."

If they can get away with saying "Studying that area is inexpedient because it's much too emotionally unpleasant," they're equivalent to a doctor who says he doesn't want a lot of sick people hanging around his office because they give visitors a bad impression. Or a man who takes a job as zoo veterinarian, then says he'll treat the rabbits and sheep, but not lions or bears because they have such bad tempers.

My impression has been that the duty of Science is to solve the tough questions—not dismiss them as "too unpleasant and difficult to consider."

I feel that if an area of research important and exceedingly relevant to human welfare, suffers from lack of definitions and fundamental understandings—that's the exact place where the most research effort is needed.

So the job's a tough one. So what! The Editor

Dear John:

We read with amusement your comment in the September Analog, written in response to a letter from Robert J. Martin, "old computers never die, they just fade away". It is unfortunate that both you and Mr. Martin, to whom we have written, did not know of the existence of the R.E.S.I.S.T.O.R.S. (Radically Emphatic Students Interested in Science Technology or Research Study). We are a group of high-school aged students who have the privilege of playing around with computers.

We have an "old, hulking, technically obsolete" Burroughs 205, a

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Packard Bell 250, and a Digital Equipment Corporation PDP-8. We also have for our use and enjoyment a teletype museum and a theater all housed in an "old, hulking, technically obsolete" barn. We have participated and presented papers at many symposiums and conferences including the last two Spring Joint Computer Conferences and the recent Digital Equipment User's Society Conference.

Incidentally, several members of the R.E.S.I.S.T.O.R.S. are writing a TRAC[tm] Language primer that will be published probably in the spring of '70.

JEROME N.B. KING
President, R.E.S.I.S.T.O.R.S.
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With their demonstrated capacities, perhaps they should change the name to CAPACITORS—Capable Ambitious People Actively Computing In Terms of Research Science?

Dear Mr. Campbell:

In the September issue, P. Schuyler Miller referred to the Ballantine Books Dolphin series by Roy Meyers as being about "a submarine 'Tarzan.'" With all due deference to the many Burroughs fans—among which I am to some extent numbered—I think the books deserve better than this.

The pattern of the stories, the details thereof, and the characters are on an altogether different level from Burroughs and his works. There is a far greater degree of realism in detail in the books of Mr. Meyers than there ever was in any of the Tarzan books. The characters behave in a more logical and reasonable manner than those of Burroughs. For example, there is no nonsense about an innate nudity taboo, nor does the male character feel an instinctive urge to shave. The life of the ocean is far more realistic than the Tarzanian jungle.

The plots exhibit a degree of sophistication never found in any of the Tarzan books. The three volumes of the series do not present a repetitive conglomeration of adventures, but a closely reasoned and logical progression of events, each different from the others. The characters develop and mature, mentally and emotionally, as well as physically, a thing which Tarzan never did.

In short, although I usually agree with Mr. Miller, I feel that I must vehemently disagree with regard to Mr. Meyers.

JAMES R. VOGUS
972 Nelaview Drive
Cleveland Heights, Ohio 44112

Burroughs's works—done in the teens and twenties—do not represent a high quality by modern standards.

But that's all right; wait fifty years and see how today's works appear!

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GOOD-BYE BARSOOM

continued from page 7

Now as every organic chemist knows, when you mix mutually soluble solvents, the melting point goes down. Each lowers the freezing point of the other. Glycerin and water, which are mutually soluble, can reach a freezing point about 30°F below zero—although water melts at 32° above, and glycerin melts at 68° above zero. If you add some ethylene glycol to that mixture, and some ethyl and methyl alcohols to that—it'd be no trick at all to get a plant juice capable of flowing freely at −125°F.

Incidentally, there's another characteristic of those simple organics. Preparing absolute alcohol is quite a trick, and it can be kept absolute only in hermetically sealed containers. Ethanol and water form a constant boiling mixture that distillation won't separate at about 85% alcohol. To get *pure* alcohol, the standard trick is to pass that solution over quicklime—CaO—which reacts chemically with water —to form $Ca(OH)_2$—but not with alcohol, and is insoluble in alcohol.

Expose that absolute alcohol to air—and it sucks water out of the air in a hurry. It's powerfully hygroscopic. Actually, glycerin, ethylene glycol and methanol are all powerfully hygroscopic. Even on Mars they wouldn't remain waterfree.

So it's not too hard to imagine a form of plant life using a water-based anti-freeze solution that would consider night temperatures of −100° or so as "ideal." And quite able to haul stray water vapor molecules out of even Mars' desiccated atmosphere.

However, there's another possibility—and one that I've never seen discussed.

During the period when Mars' orbit brings it closest to the sun,

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PLACE	TITLE	AUTHOR	POINTS
1.	The Yngling (Conc.)	*John Dalmas*	2.08
2.	Gottlos	*Colin Kapp*	2.21
3.	The Ambassadors	*J. B. Clarke*	2.62
4.	Shapes to Come	*Edward Wellen*	3.75
5.	Weapon of the Ages	*W. Macfarlane*	4.28

THE EDITOR

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it is summer in the southern hemisphere. Now a Martian season is almost twice as long as one of Earth's, because of the greater orbit. So for almost an Earth-year, the Martian south polar area has its summer.

Mars is tilted in its orbit, just as Earth is; during the long antarctic summer, there are months on end when the sun shines steadily in the sky; there is no night.

Remember that our Arctic regions, while they have bitter winters, have hot and muggy summers; Alaskan mosquitoes are fabled. It's frequently warmer in Nome, or Point Barrow, during early fall than it is in New York; even a slanting sunlight that never lets up, day or "night," keeps temperatures warm.

The south polar area of Mars bids fair to be a fine place to establish some Earth crops, when men get there; the weather is mild, equable, and there's plenty of sunshine for crops. For many months on end, the temperatures remain well above freezing.

It *does* get a little chilly during the near-year-long polar nights, of course—but plants evolved for the planet would probably go dormant quite comfortably. After all, the Pamir Plateau plants manage here on Earth! And lower life forms have been found in our antarctic ice-and-snow areas.

So there's reason to believe that plant forms could evolve to live very comfortably in the Martian equatorial and temperate zones, while special annuals evolved for the lush, warm antarctic region!

And it's a pretty fair bet that if a photosynthetic class of organisms evolve—something will fill the rest of the ecological system. Some sort of herbivore will show up. Probably very slow-moving (in our terms) and insectile types—with insectivores to bite 'em.

The fundamental law of biology is that *the conditions in which an organism evolved will appear to that organism ideal.*

Unfortunately, that applies to Terrestrial Man—and that effect has been sufficiently powerful to tend to make our biologists restrict their thinking as to what *could* be "ideal" for organisms on another planet.

On Earth, we're beginning to be able to say "This is how life starts"; we should be saying "This is how life started *here*."

Life on Mars may have started in a very different manner indeed.

But minor difficulties like 180° diurnal temperature ranges, −200° winter temperatures, and minuscule quantities of water aren't really tough problems to organic evolution! It just takes a different approach to things.

But one thing is for sure; there are no six-limbed green Martians dashing around on their multi-legged *thoats.*

Barsoom is dead!

THE EDITOR.

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America needs your help.

There is a new plan for Americans who want to help their country as they help themselves. Now, when you buy U. S. Savings Bonds through Payroll Savings where you work, or through Bond-a-Month where you bank, you are also entitled to purchase the new higher-paying Freedom Shares. They are available on a one-for-one basis with Savings Bonds in four denominations and are redeemable after one year. Sign up soon.

Questions and answers about Freedom Shares.

Q. What are Freedom Shares?

A. They are the new U.S. Savings Notes — a companion product to the Series E Savings Bond.

Q. Who may buy Freedom Shares?

A. Any individual who purchases Series E Bonds regularly through a formal plan — either Payroll Savings where he works or Bond-a-Month where he banks.

Q. What is the interest rate on Freedom Shares?

A. 4.74% compounded semiannually, when held to maturity of 4½ years. The rate is less if redeemed prior to maturity; and they may not be redeemed for at least one year.

Q. Does this same rate now apply to E Bonds?

A. No. E Bonds continue to return an average of 4.15% when held to their seven-year maturity.

Q. What do Freedom Shares cost?

A. They are issued in face amounts of $25, $50, $75, and $100. Purchase prices are $20.25, $40.50, $60.75, and $81.00.

Q. Can Freedom Shares be bought by themselves?

A. No. They must be bought in conjunction with E Bonds of the same or larger face amounts.

Q. Can I buy as many Freedom Shares as I want, as long as I buy E bonds of the same or larger amounts?

A. No. On Payroll Savings, Freedom Share deductions are limited to $20.25 per weekly pay period, $40.50 per bi-weekly or semimonthly pay period, $81.00 per monthly pay period. On Bond-a-Month, the limit on Freedom Share deductions is $81.00 per month.

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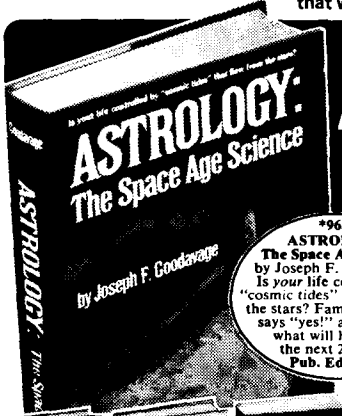

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